January 1987

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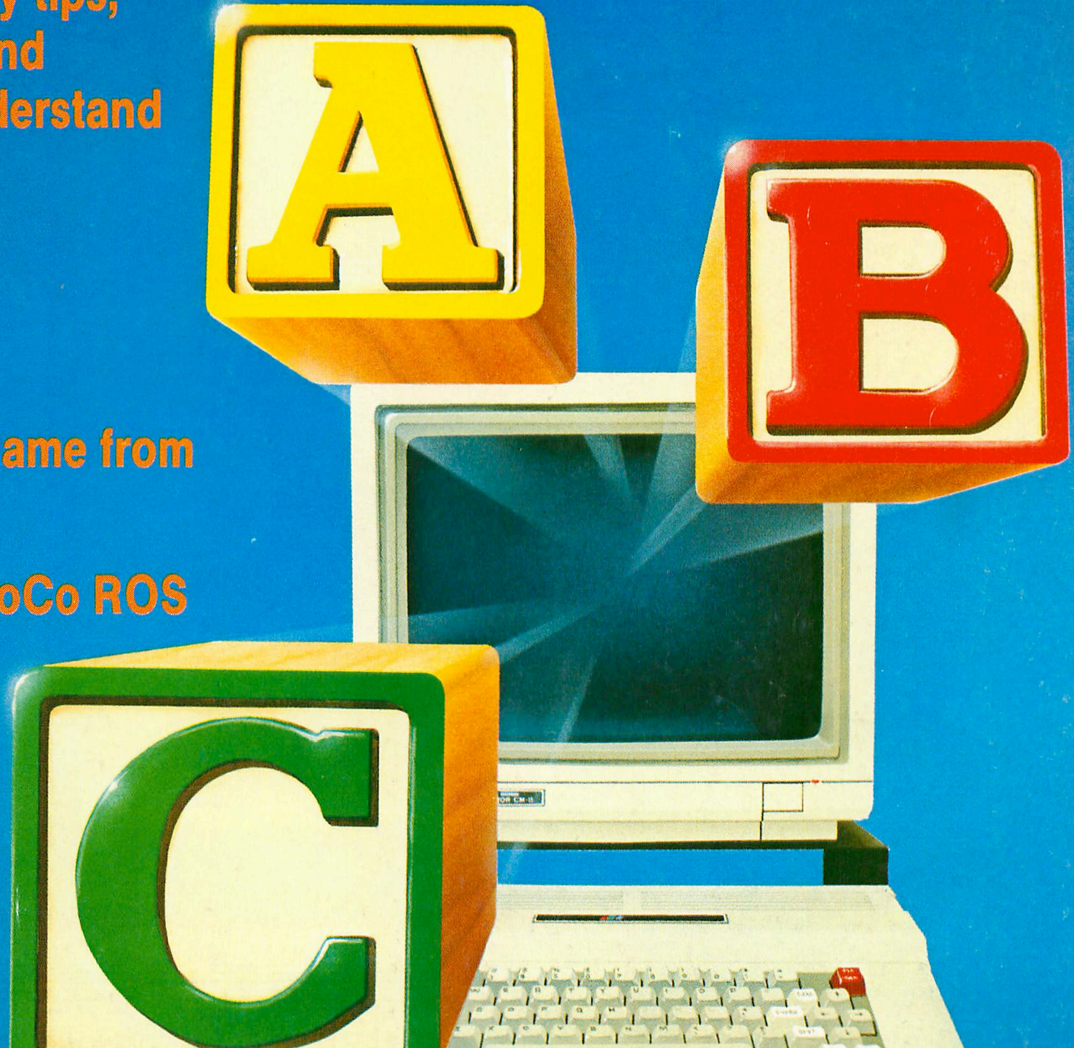

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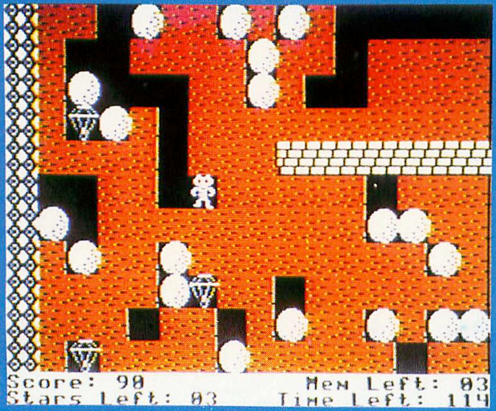

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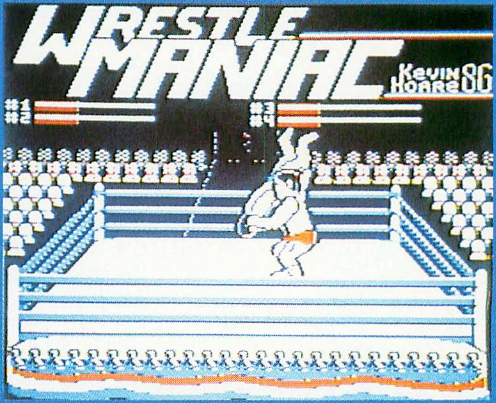

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MARBLE MAZE

SCORE: 1,500 LEVEL 1 TIME 58

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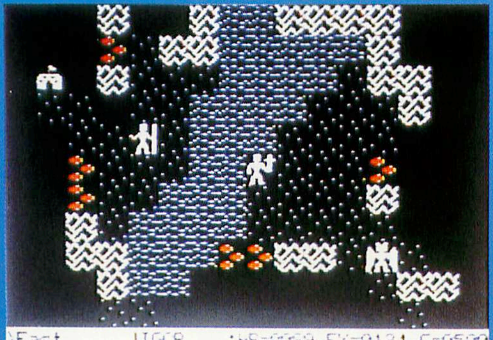

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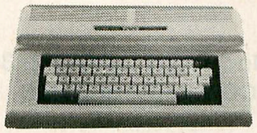

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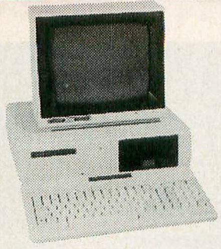

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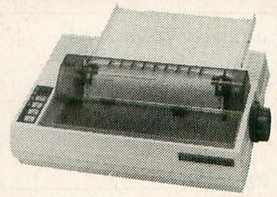

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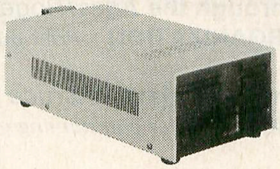

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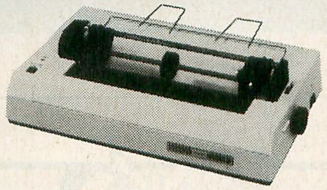

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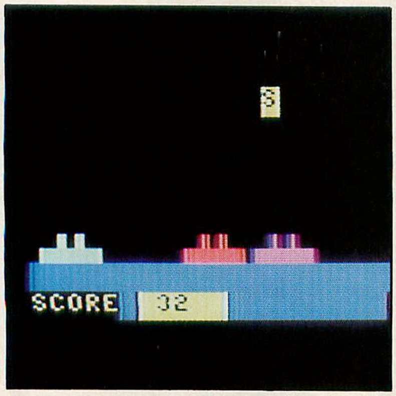

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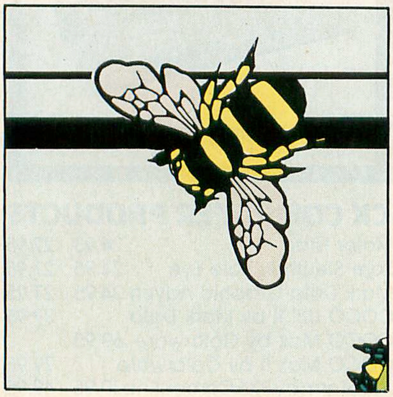

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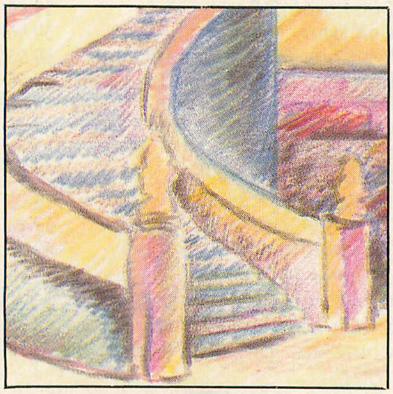

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The cassette tape/disk symbols beside features and columns indicate that the program listings with those articles are on this month's RAINBOW ON TAPE and RAINBOW ON DISK. Those with only the disk symbol are not available on RAINBOW ON TAPE. For details, check the RAINBOW ON TAPE and RAINBOW ON DISK ads on pages 103 and 151.

NEXT MONTH: Ah, lacy cards and rosy cupids. It's that sentimental time of year and THE RAINBOW is prepared with titillating tidbits to let you fall in love with your CoCo all over again. February brings our Utilities Issue filled with interesting and helpful programs for all. We'll finish our series on the robot operating system and introduce you to some more of the CoCo 3's wonders. And, of course, we'll have reviews of the latest products, plus our regular columns.

Valentine's Day is the time to make the perfect match — your Color Computer and THE RAINBOW.

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January 1987 Vol. VI No. 6

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LETTERS TO THE RAINBOW

The Doc's Still Hot!

Editor:

I have been receiving THE RAINBOW since the demise of *HOT CoCo*. One article I have missed is Doctor ASCII, so imagine my surprise when I received the November 1986 issue to find it a regular feature.

I used to turn to this article first thing upon receiving *HOT CoCo* and even though I have never submitted any questions, I have had many of them answered.

Clair Hunt
Sanford, MI

Glad you're a fan of Doctor ASCII's column. We welcome him as a regular columnist in RAINBOW. His column is on Page 162 of this issue.

RAINBOWfest Raves

Editor:

I just wanted to let you know what a good time I had at the Princeton RAINBOWfest. For those who have never attended a RAINBOWfest I urge them to go. This was my first but it won't be my last. I met some great people and it was fun to see the faces that go with the names in the magazine.

I hadn't been using my Color Computer that much until I picked up THE RAINBOW and decided to go to the RAINBOWfest. I bought the new CoCo 3 and have sent for a subscription to RAINBOW. I am excited all over again about the CoCo, and I can thank you and the RAINBOWfest for this new excitement.

Larry Burlingame
Selinsgrove, PA

Telecom Successes

Editor:

I would like to comment about the article "Hamming It Up" on Page 42 in the November 1986 issue. Our Air Force MARS Base Support Team at Langley AFB recently used a CoCo 2 with the RS-232 pack and a GLB PK II TNC for a VHF packet demonstration at the Langley Air Force Base Open House. The system operated fine through the five-hour program, logging and transmitting 176 pieces of morale and welfare traffic to a central point across the base. There, the printed out messages were sorted according to region destination and introduced into the regular SSB MARS phone nets for delivery.

James S. Johnson
WB4WDM/AFF2VA
Hampton, VA

THE NEW ADDITION

Editor:

After recently having problems with my CoCo 1, I purchased a CoCo 3. I discovered a few things other readers might like to know:

1) *VIP* software will not run on the CoCo 3. I use *VIP Writer* and *Database* extensively, and now must find something to replace them.

2) *PenPal* Version 1 will not run on the CoCo 3. I don't know about the later version.

3) The DISTO Super Controller works on a CoCo 3. However, C-DOS, ADOS, JDOS, etc., do not work. Only RS-DOS will work, so far.

If someone comes up with a patch to allow *VIP* to run on the CoCo 3, I hope you will print it. I don't really want to go to another software package after having so much success with *VIP*.

Tony Rapson
Tulsa, OK

For some good news, see Jim Reed's column on Page 16.

Better, But Not Quite . . .

Editor:

The new CoCo 3 is an amazing new computer. It has everything the CoCo Community has been waiting for — better graphics, compatibility, etc., but there are still a few things we need. One of the things needed is more function keys on the keyboard or even better, a keyboard like the Tandy 1000's. Now that we have windows, we need a new Multi-Pak with about eight slots for more expansion.

Leslie Miller
Lewiston, ID

List Those Variables

Editor:

I have been reading RAINBOW since November 1984. During that time I have seen some changes in your program listings that make them even better and easier to use. On Page 53 of the September 1986 issue, I noted that Mr. Kromeke has included a variable list at the beginning of his program. I wish that all of the programs had such a list. It makes the programs more understandable for users.

Regan Werner
Pueblo, CO

HINTS AND TIPS

Editor:

For those who use *VIP Desktop* and want room for a small program or two, here is how to get two free granules. Grans 20 and 21 are unused so it is a matter of changing the GAT (Granule Allocation Table) to enable you to put programs there.

Boot up *VIP Disk-Zap* and, following the instructions in the manual, change bytes 20 and 21 of Track 17, Sector 2 to "FF." I have a one-gran boot program and a one-gran backup program on my disks and they speed things up greatly.

A word of caution. I do not know if there is more than one version of *Desktop* so you should examine grans 20 and 21 with *Desk-Zap* before modifying the disk.

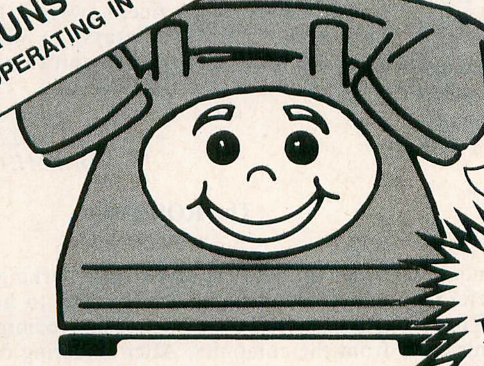
Bob Owen
Wilmington, NC

Improved Graphics Dump

Editor:

For those of you with Radio Shack DMP-130 printers who are unhappy with the print options available when using *CoCo Max*, here is one solution. If you configure *CoCo Max* and request the Epson MX as the printer to be used, then it is possible to switch the DMP-130 to IBM mode and it will dump the pictures in a much more satisfactory manner. One problem is that you need to use a serial-to-parallel converter in order to use the IBM mode of the DMP-130. The advantages are great; it is possible to do a "double-size" dump and the double-strike looks a lot better.

J.M. Perry
Dublin, Ireland



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PUTTY IN YOUR HANDS

The word processor can be used to create, print, and/or save on file your personal KSMs. They let AUTOTERM act like you. For example, it can dial through your modem, sign-on, interact, perform file operations, & sign-off; an entire session without your help. KSMs can answer the phone, prompt the caller, take messages, save them, hang-up, and wait for the next call. The KSM potential is unbelievable!

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Phyllis.

DOS in Time

Editor:

Many times in my programming efforts I need to know what type of DOS is being used. To find out what type is used so that proper pokes can be made, type `A=PEEK(308):PRINT A`. The table below lists values.

A	DOS
19	Radio Shack Disk BASIC 1.0
20	Radio Shack Disk BASIC 1.1
29	Spectro Systems ADOS 1.01

I hope this information helps others in their programming endeavors.

David W. Ostler
High Point, NC

REQUEST HOTLINE

Editor:

It would be nice if someone would make a program to calculate electric and gas meters to determine usage to verify gas and electric company bills. Instead of using four circles to show meter dials, I would like it to input 1-12 o'clock setting to show meter dial arrows, then calculate it from the last meter taking date. By phoning the utility company, one could find out the regular date the meter was read, then use that date as the starting date to read.

Bob Baker
Box 254789
Sacramento, CA 95825

Tired of Plain Vanilla

Editor:

Does anyone know where I can buy colored computer paper with matching envelopes?

Dr. Hugo D. Spatz
749 Nyack Avenue N.E.
Port Charlotte, FL 33952

See "Pipeline" in the November 1986 issue for information on hi-tech Stationery.

Building the Perfect Adventure

Editor:

I am looking for an Adventure construction set for my CoCo 2. If anyone knows where I can find one, please write to me.

Danny Cordonnier
5003 Villa Circle
Colorado Springs, CO 80918

Check out "The Adventure Processor" on Page 26 in the August 1986 issue.

Needs Telemetry System

Editor:

Does any company market hardware, transmitters and receivers for telemetry systems that could be run by the CoCo? Its use would be to monitor water pumps in a small water system. Must be FCC approved.

Paul Wisinger
Greenwood Town Hall
P.O. Box 195
Greenwood, LA 71033

Distaff Stats

Editor:

I play hockey on a women's team and have been assigned to do the statistics. Does anyone have a program to enable me to do the stats on my computer?

Debbie Bechard
3-842 Pillette Road
Windsor, Ontario
Canada N8Y 3B5

Reprinting Roger

Editor:

The past few months you have had inquiries about tape-to-disk transfers. You refer to the January 1984 issue, Page 48, Roger Schrag's "A Tape to Disk Transfer Vehicle." The January 1984 issue of RAINBOW is not available as a back issue and I cannot find a copy through various library sources. I expect others may have difficulty locating the referred article.

Allen Hoffman
W. Richland, WA

You can order copies of a particular article from an out-of-print issue for $2. You need to send us the title of the article, author and what issue the article appeared in.

In this case, however, due to popular demand, we plan to reprint Roger's article in our February 1987 issue.

INFORMATION PLEASE

Editor:

I've been working on a boot program and haven't found a way to prevent the prompt sign from appearing. Is there any way to automatically run a program after loading from cassette?

Jason Matheny
1008 Audubon Parkway
Louisville, KY 40213

Error Terror

Editor:

My CoCo 2 has a terrible case of I/O Errors, although I am using the standard Radio Shack CCR-81 recorder and C-20 tapes. Sometimes my programs will load without errors, while other times no programs will load even though they were saved in succession. After typing the same program several times, I would like to know if there is a poke or program to disable the I/O Error and recover the program.

Jerry Broughton
R.D. #1, Box 28
Morris, PA 16938

The Line Starts Here

Editor:

I just purchased an Epson JX-80 printer. It has a four-color ribbon and is capable of printing in seven colors. It works great with *Telewriter*'s method of defining and embedding printer codes right in the text. I need a color screen dump which supports this printer's superb Hi-Res graphics capabilities.

I have written to distributors of several of the major graphics editors (*Graphicom*, *CoCo Max II*, etc.) and none of them currently support the JX-80's color features (normal black works fine, however). If you have one of these printers, or plan to purchase one, please let the software companies know of your interest.

Laura Burch
52 Elm Street
Newport, ME 04953

The ROS CoCo

Editor:

My grandfather and I were working on a remote-control car and decided to have a 64K CoCo 2 control it using commands from the computer. After soldering capacitors and resistors on a board, and hooking it up to a male and female connector, I'm not sure where to hook the connector or what commands to use. Please help.

Also, I am interested in exploring the different parameters of machine language and animated graphics using BASIC statements such as GET and PUT. I was wondering if anyone could reply and tell me how to do animated graphics or machine language programming.

Eddy Learnard
110 Park Avenue
Williston Park, NY 11596

See our three-part series on ROS (Robotic Operating System) which started in the December 1986 issue. Part 2 is on Page 153 of this issue; Part 3 will appear next month.

You may find the answers in the October 1986 Graphics issue.

Small Business Needs

Editor:

I have yet to see a good inventory control program. I am sure the CoCo 3 can handle such a program. If I may speak for other small-business men, there is a definite need for a program that can handle the following: catalog number, page number, item description, packing, cost per pack, mark up and retail price with the number in stock. There needs to be an auto reorder point, so when a particular item goes below a certain number the program will send the items to be reordered as well as a complete inventory to the printer list, which can be printed on tape, disk or fanfold paper.

If such a program is available, I would appreciate knowing where it can be purchased.

Henry R. Barish
135 Madison Street
Apt. 10
Wellsville, NY 14895

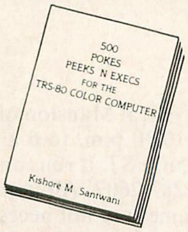
BOUQUETS

Editor:

Recently I experienced crashed disks on a terminal program which I had purchased from Spectrum Projects, a RAINBOW adver-

500 POKEs, PEEKs, 'N EXECs

FOR THE TRS-80 COCO



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Except NY. For information, technical information, NY orders & after-hours **1-716-223-1477** tiser. When I wrote them explaining my problem and inquiring about the cost of replacement, I received by return mail two replacement disks and a letter of apology for my inconvenience from Paul Rosen. Companies like Spectrum deserve all possible support.

Lawrence Gibbs
Cochranville, PA

Plus Promptness

Editor:

This is a letter of praise for Computer Plus. I got my DMP-105 printer in eight days after mailing my check to them. The toll-free number is nice too, since I was able to find out beforehand just how much the postage and handling was to be.

Jerome Bigge
Muskegon, MI

Some Exceptions

Editor:

This is to inform all users of Speech Systems software and/or hardware products that, due to the extensive care we take with the design and production of our offerings to the CoCo Community, all of our products (save three) will execute unmodified on the CoCo 3.

The first exception is E.A.R.S. That, too, will run if you type `EXEC &HE010` and press `ENTER` before the subsequent `CLOADM` and `EXEC` of `EARS.BIN`.

The second exception is CoCo MIDI. Disregard the following if you're using a Y-cable. The following is for multipack users. The disk controller must be in Slot 4. The CoCo MIDI pack must be in Slot 3. Turn on the computer and type:

```
POKE 65407,51:EXEC57360
```

The third exception is for *Super Voice*. The Super Voice Speech Synthesizer works perfectly in the CoCo 3 as outlined in the manual. However, the CoCo 1 and CoCo 2 would let you get sloppy and not force you to `CLEAR100,&H5FFF` to `LOADM"TRNSLATE"` or `CLEAR100,&H57FF` to `LOADM"SUPERTOK"` even though you are supposed to. The CoCo 3 forces you to do this. Failure to do this will not allow you to load the program.

Thanks to all of you for your continued support; and thank you too, RAINBOW, for being the best friend the CoCo ever had!

Randy H. Spector
Vice President, Speech Systems
Batavia, IL

BULLETIN BOARD SYSEMS

Editor:

The Tandy Color SIG CoCo TBBS of the South Bay Color Computer User's Group has a new phone number which is Voice (408) 923-2967, Tandy CoCo BBS (408) 244-8250. We want this BBS to be one of the best CoCo/recreational boards in California. The board is running several CoCo subboards and many various discussion/entertainment boards. Each of the CoCo boards has its own up/download ability corresponding to the topic of the board (example: graphics, music, general, games). Check it out and please consider joining our CoCo club, the South Bay CoCo User's Group of the Santa Clara Valley.

John Say
San Jose, CA

- The CoCo Communications newsletter is going strong. This newsletter has a list of 24-hour CoCo BBSs throughout the world. Also has reviews on BBS software, modems, terminal software, a review on 24-hour BBS in each state each month. There will also be a mailbag for people to leave messages in or ask questions about BBS hardware, software, etc. The cost is $2. The new address is:

Steve Slack
6 Saddle Circle
Newark, DE 19711

- Fast Trackin' BBS has added Run Length Encoded graphics (RLE) online for the callers' viewing pleasure. (SysOps interested call BBS for information.) These graphics files can be viewed using Mike Ward's RLETRM or CIS Vidtex. There are plenty of other graphics online, digitized and drawn by Mike Trammell of New York. There are also games, communications, utilities and music files, plus a Stuff file that can be added to for some helpful hints. The 1.08-Meg BBS is still running on the reliable backup MODEM II until service can be found for the 1200 baud Data Phone.

The BBS operates on an open format. Callers must leave their name, address and phone number before being validated to use the BBS. After validation, within 24 hours if all information has been left, the callers will be able to retrieve files. All menus can be viewed beforehand. The BBS number is (502) 365-7771 and operates 24 hours a day.

David Guess
Princeton, KY

- To access Omni-Com BBS call (601) 497-OMNI or (601) 875-8688. It runs 24 hours, 300/1200 baud, 7-bit, even, 1 stop.

Omni-Com Data Telecommunications
Gautier, MS

- If you are looking for a BBS system loaded with CoCo software, Access-80 is the board to call. It has many special interest areas (SIAs), one of which is dedicated to the CoCo. Call (603) 888-6999, 24 hours a day, 300/1200 baud.

Bruce Burleson
Nashua, NH

- I have a 64K CoCo with dual disk drives, a printer and a DCM-5 modem, and I would like to get in touch with a BBS near or in the Belle-Mead area. Anyone interested, please write me soon.

Scott Enman
88 Steinmetz Road
Belle-Mead, NJ 08502

- I am running a BBS at (201) 382-8252 called The Final Frontier. Callers can participate in the multi-player interactive *Star Trek* game. I also have a lot of *Star Trek* downloads.

Derrick
Colonia, NJ

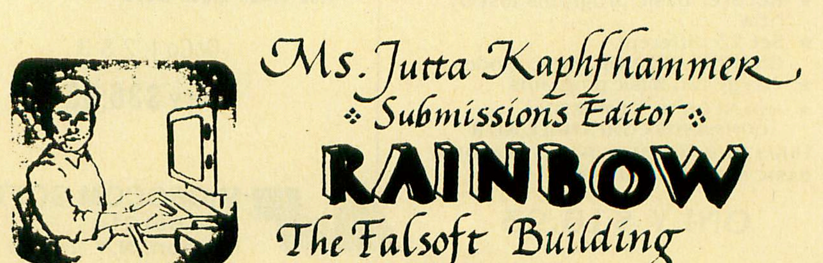
- The Mystical Mansion of Madgarr BBS hours are 10:30 p.m. to 6 a.m. and from 9 a.m. to 2 p.m. EST. It runs on 300 baud only. Call (304) 287-2607. All users are validated and real names are not necessary.

Mark Richards
Carolina, WV

THE RAINBOW welcomes letters to the editors. Mail should be addressed to: Letters to Rainbow, The Falsoft Building, P.O. Box 385, Prospect, KY 40059. Letters should include the writer's full name and address. Letters may be edited for purposes of clarity or space.

Letters to the editors may also be sent to us through the MAIL section of our Delphi CoCo SIG. From the CoCo SIG> prompt, pick MAIL, then type SEND and address to: EDITORS. Be sure to include your complete name and address.

ARTS AND LETTERS



Envelope of the Month

Jim Bennett
Front Royal, VA

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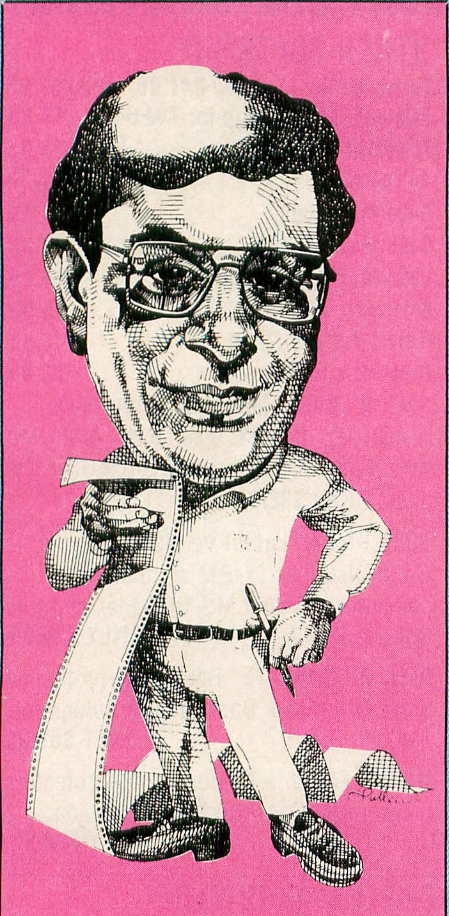

We Keep On Keeping On

Probably the number one subject of letters to RAINBOW these last several weeks has concerned the CoCo 3 and what programs will and will not run on it. First of all, I want you to know that we're doing as much as we can to get as much accurate information together as possible and to get it to you.

In his column this month, Jim Reed addresses a few of the problems and is giving the most-asked questions some answers. Our Q-and-A columns are trying to address things, as well. I'll try not to duplicate those letters here.

While we'll certainly keep on keeping on in this regard, I do think that a couple of observations are in order.

The first is, of course, that those people who "followed the rules" for third-party software really don't have a problem. It is the people who did not who may have some incompatibility problems. Some of these firms will provide fixes; we will attempt to find some fixes when we can and, as always, fixes may well come in from other members of the CoCo Community. When they do, we'll pass them on to you.

The second issue is a little more philosophical, however.

Let's consider this: Many of the programs written for the CoCo and CoCo 2 were "gee whiz" simply because they did something really special that, now, you might take for granted with the CoCo 3. My best example is *Telewriter.* I remember when it first came out and we sat down and simply "gee-whizzed" at the high resolution screen. This, remember, was in the days long before 80-column cards and the like.

Other programs came along, like *Elite-Word*, and all of them did the same thing. So did a bunch of database managers, telecommunication packages and the like. Before long, it was pretty well-established that a Hi-Res screen was necessary for the more "business-oriented" functions of the Color Computer. In the last two years, no one would have seriously considered marketing a word processor, for instance, that did not have a high resolution screen display.

But when Dick White and I first saw *Telewriter*, the first question in our minds was "how did they *do* that?" Dick figured it out (he knows a lot more about programming than I do). All I did was use it.

My point, however, was that it was done with programming. And that programming required a great deal of program space. Even in machine language, it had to make the CoCo run slower. It also used up programming space that might have been devoted to more features (although I have always been satisfied with the features available in *Telewriter*, myself).

Printer Interface Package

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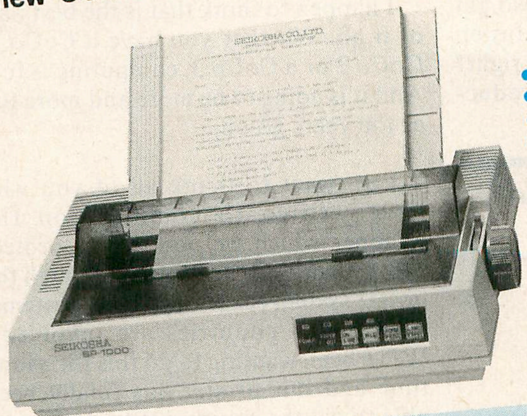
Compatible with the new COCO3



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- True descenders
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Printer is covered with a two-year warranty.

This package includes the SP-1000A Printer, a true parallel printer, not the SP-1000AS which is a serial printer that cannot operate at the standard Color Computer Baud Rate of 600.

Model 101 Interface $39.95

The Model 101 is a serial to parallel interface intended for use with a COCO and any Centronics compatible parallel input printer. The 101 has 6 switch selectable baud rates (300-9600). The 101 is only 4" × 2" × 1" and comes with all cables and connectors for your computer and printer.

Model 102 Switcher $35.95

The Model 102 has 3 switch positions that allow you to switch your computer's serial output between 3 different devices (modem, printers or another computer). The 102 has color coded lights that indicate the switch position. These lights also act as power indicators to let you know your computer is on. Supplied with the 102 are color coded labels that can be applied to your accessories. The 102 has a heavy guage anodized aluminum cabinet with non-slip rubber feet.

The Model 104 Deluxe Interface $51.95

The Model 104 is a serial to parallel interface like the Model 101 but it has the added feature of a serial port (sometimes referred to as a modem switch). This feature allows the connection of a parallel printer and any serial device (modem, serial printer etc.) to your computer. You may then select either output, serial or parallel, with the flip of a switch. The 104 is only 4.5" × 2.5" × 1.25" and comes with all cables and connectors for your computer. You supply the serial cable for your modem or other serial device.

Cassette Label Program $6.95

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ON BOTH SIDES
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New Version 1.3 Tape transferrable to disk. Now save and load Labels from tape or disk.

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High Quality 5 Screw Shell C-10 Cassette Tapes $7.50 per dozen

Hard Plastic Storage Boxes for Cassette Tapes $2.50 per dozen

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The CoCo 3's high resolution modes eliminate the need to "program in" a high resolution screen. This means it speeds up a program (because the CoCo 3 does not have to use software to maintain the screen) and it allows more "space" for more features.

The same goes for most of the "artifact color" programs. Heck, you don't need artifact colors when you have 16 regular colors available at a time in BASIC. But I remember when Mark Data Products introduced its first animated graphics Adventure games. They, too, set a standard. CoCo 3 has some problems with the artifact colors because it doesn't really need them. It has real colors.

I guess my point is that there are two ways to look at CoCo 3 and its "downward compatibility." The first is that there are, indeed, some things that do not (will not) work as they did before. The other way is that more and better things will come out of the new machine.

Yes, I know it also means that you might be in a position to buy some new software. But, in truth, much of what you now use will run on the CoCo 3. That which does not will probably have some "better" version available in the next few months or so.

I can see there is room for some disagreement here. It is certainly possible to take the position that "I have bought all the software I want to buy." If that is so, then sure, there may be a problem. But, I, personally, have always seen a computer as an evolving system. When something decidedly "better" comes along, I want it. It improves both my enjoyment and productivity.

Here is an example, albeit extreme. When the laser printers came out, we went out and bought one. Before, we had been doing listings in double-strike and "emphasis" mode to make sure we had good, clear copy. The lasers changed all of that. Not only did we get good, clear and black copy, we also got it, seemingly, hundreds of times faster. But we already had a printer, right? Why change? Because of simple productivity.

"I, personally, have always seen a computer as an evolving system. When something decidedly 'better' comes along, I want it."

I am not advocating you go out and buy a laser printer (unless you do very heavy printing on your CoCo, as we do). What I am saying is that we saw something that would work better and we got it.

In what are, admittedly, the very early stages of the CoCo 3, things are kind of up in the air right now. No one, even here at the RAINBOW, has every version of every program. But we are working diligently to test things as we can. We'll help as much as we can.

But, remember, too, we have a magazine to put out and new programs to test as well. Of course, we are working on all of this, and will keep on keeping on. One of the reasons we will is because we owe it to you to do as much as we can. And the other reason is that it is just plain fun.

I happen to think that is the best part of it all. Whether you have a CoCo, a CoCo 2 or a CoCo 3, computing is fun. And it is going to be more and more fun as the years go on.

I do want to thank all of you who have written to comment on the wrapper which we now use to protect THE RAINBOW in its venture through the postal system (or should I say systems, since many countries are involved). We've been wanting to do this for a long time and our printer has finally been able to get the equipment to do it.

I am also gratified to see how many of you took the time to drop me a line to say something about the subscription offer packed in the CoCo 3 boxes. Most of you said that you already have a subscription, but that it was "nice to see" this happening.

A suggestion if I may: Give that little envelope to a friend. Anyone can use it! And we're delighted to get those envelopes!

A happy CoCo New Year to each of you!

— Lonnie Falk

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BUILDING JANUARY'S RAINBOW

Identifying the CoCo 3 "challenge" . . .

. . . and working together to meet it!

This is our annual beginners issue and we have more beginners than ever this year. Even the "old soldiers" are getting into "new beginnings" as the CoCo Community assesses the Color Computer 3 and what we are going to do with it.

With more memory, 80 columns, real lowercase and much higher resolution graphics, there's a new wave of excitement. But, there's also what the uninitiated might mistakenly regard as pessimism, the talk about what the new CoCo 3 *won't do*. Tandy did a much better job with respect to preserving compatibility than many CoCo veterans were expecting, and deserve high marks for doing so; still, old timers will try out dozens of programs, most of which run fine and without incident, and then, when they find one that won't work right on the new machine, you'd think the world was at an end. Well, you have to read between the lines of "bellyaching" to recognize "the challenge." Yessir, there's nothing a Radio Shack junkie likes better than the challenge, and opportunity, offered by something that needs a bit of fixing.

I am firmly convinced that the CoCo Community will meet the CoCo 3 challenges that lie ahead, and "getting there" will be half the fun. You can rest assured that, as the rough edges and problem areas are identified and fixes or patches or rewrites become available, we'll report it all to you as soon as we can. For instance, in this issue, Dick White reports that older disk controllers (those requiring 12 volts) won't work with the CoCo 3, at least without some modification — not big news since they wouldn't work with the CoCo 2 either. Perhaps the easiest way to get 12 volts to the controller is to use a Multi-Pak Interface, but *these units themselves* need a minor upgrade to work with the CoCo 3. Not to worry, the cost of parts is small and our article "A PAL for Your CoCo 3" explains how to do this upgrade yourself.

In "Turn of the Screw," Tony DiStefano discusses the different types of monitors, since the CoCo 3 needs an RGB analog monitor for best results. In "CoCo Consultations," Marty Goodman discusses why `PMODE4` artifact colors don't work on RGB analog monitors. Roger Bouchard says those with monochrome monitors will want to kill the color burst for greater clarity: Use `POKE &HE033, PEEK (&HE033) OR &H10` for the 32-column mode, and replace the `&HE033` address above with `&HE03C` for 40 columns or `&HE045` for 80-column mode. If the screen then looks a bit dim, try `CLS 5` to brighten things up. Richard Esposito informs us that no provision was made under BASIC for saving the new CoCo 3 Hi-Res screens to disk, but then tells us how in "Doctor ASCII."

In his column, Bill Barden says *Color Disk EDTASM* works just fine, almost. In our letters section, Speech Systems' Randy Spector give a rundown on that company's products and what to do to fix the three that need patching. Look for similar reports from others in upcoming issues. Incidentally, I hear that OS-9 Level II should begin appearing in the stores by the time you see this, and that the 1,100-page manual has been the holdup.

While some CoCo programs may require major rewrites, many just need a bit of modification. For instance, some VIP programs appear to work while other versions of the same program have problems on the CoCo 3. Marty has discovered that the memory test that runs at bootup of *VIP Writer* writes over the top 256 bytes of memory on the CoCo 3 (`$FE00-$FEFF`). The test must be made to stay out of this region to avoid "crashing." If you can use a disk zapper, try changing the `$FF00` at `$6817` to `$FE00`, though the fix may vary from version to version.

Similar problems affect Radio Shack's *Ghana Bwana, Desert Rider, One-On-One* and *Pitfall II*, but these are now patched and they run in full color, too. Look for these longer fixes to be posted soon in our Delphi CoCo Sig and we'll include them along with assembled notes, such as the discovery that Radio Shack's Sound/Speech Program Pak won't run right at double-speed, in a "round up" of fixes in a future issue of RAINBOW. At this writing (mid-November), the information is just beginning to come in.

To stay abreast of the latest CoCo 3 news, and to learn how to get the most from your present system, or that bargain-priced CoCo 2 you just got for Christmas, or that old gray workhorse with the paint half rubbed off, why not make this a "beginning" of your own, by joining the tens of thousands who take advantage of an annual subscription to keep following THE RAINBOW.

— Jim Reed

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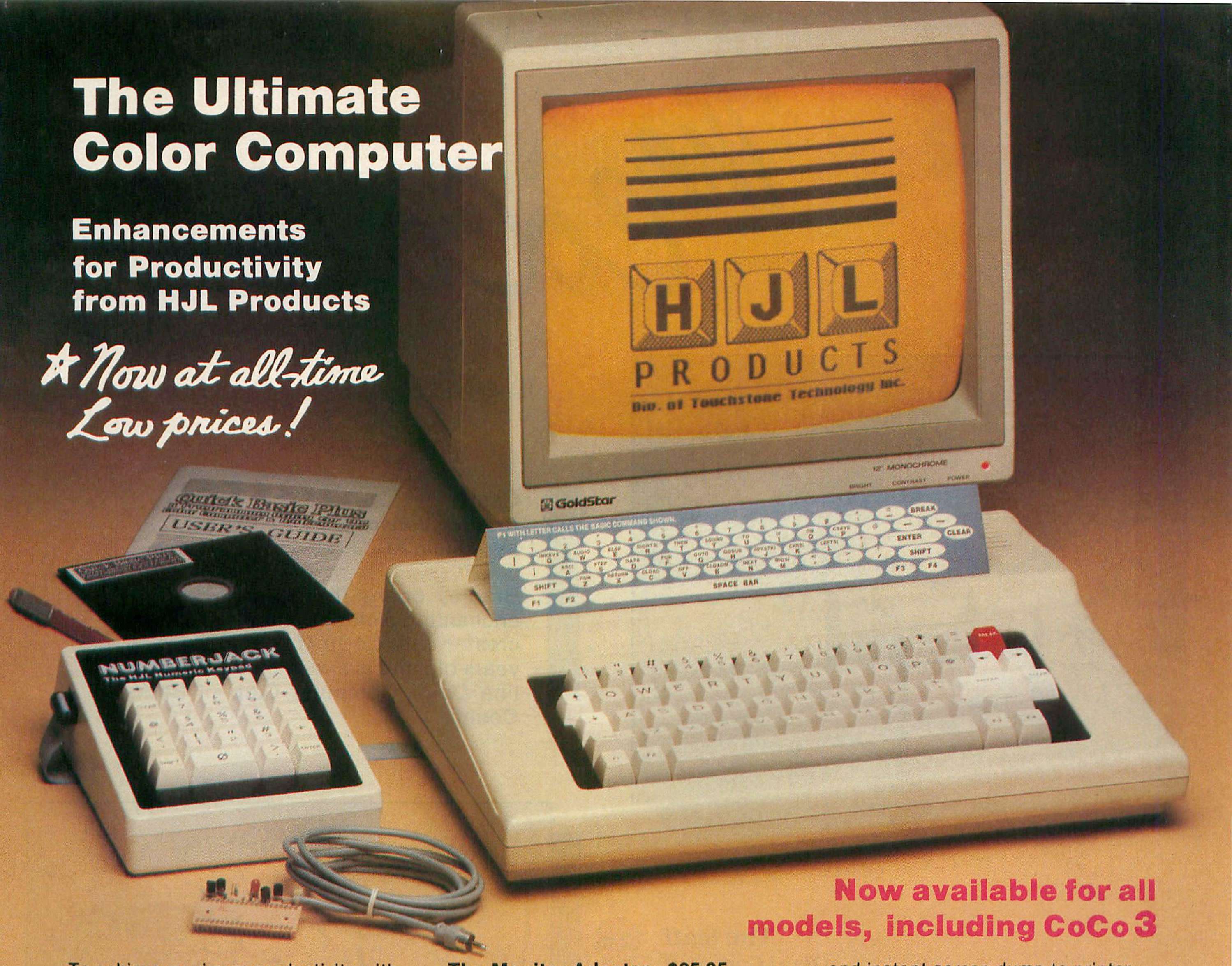

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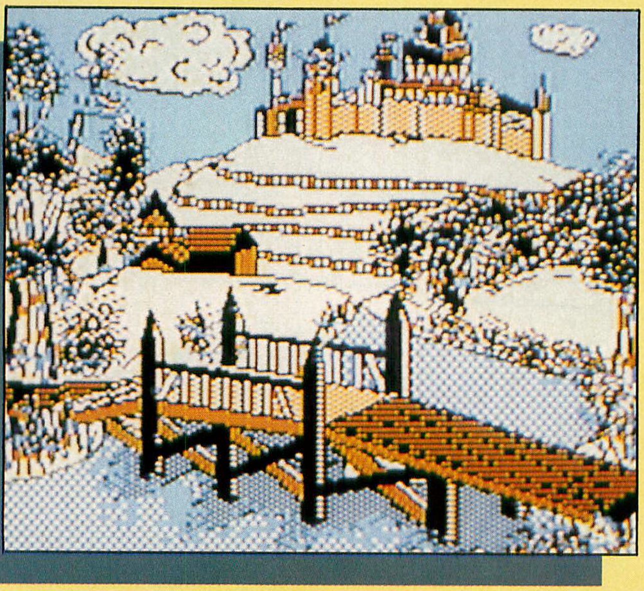
The CoCo Gallery



1st PRIZE

Castle

Bradley Bansner

Wyomissing, PA

Bradley opens the gallery with this enchanting pictorial setting which was created with *CoCo Max*. Bradley is 15 years old and is a member of the Skyline Color Computer Club of Berks County.

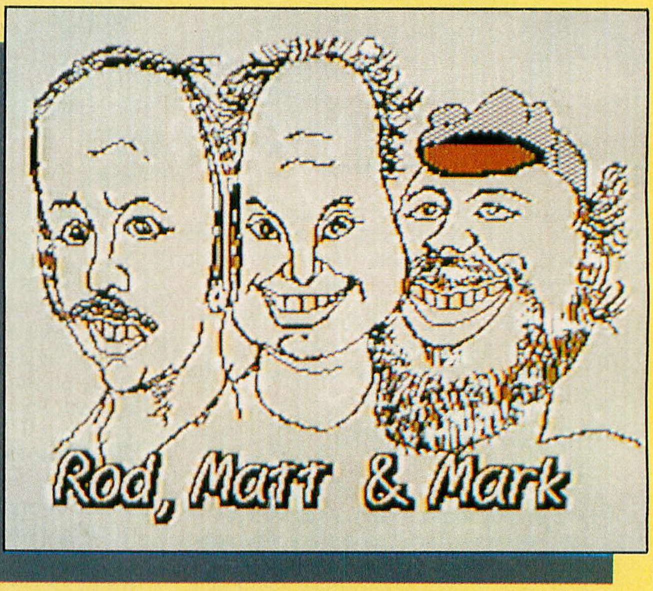
2nd PRIZE

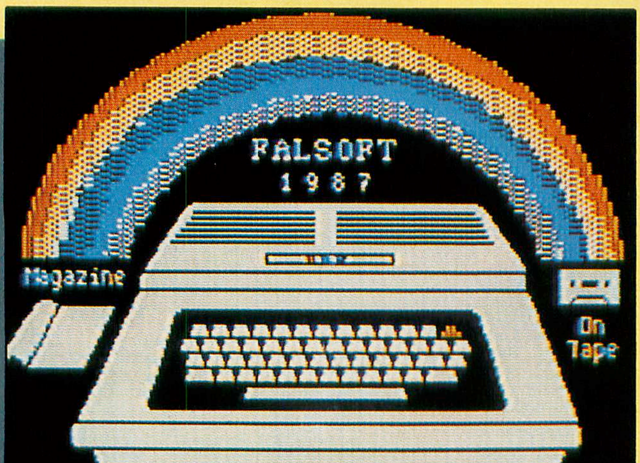
The Staff

Omni-Com Staff

Gautier, MS

This caricature of the Omni-Com staff was created with BASIC, a Radio Shack X-Pad and *CoCo Max II*'s Fat Bits. From left to right are Rod Roberts, Matt Welch and Mark Welch.





3rd PRIZE

Rainbow

Steve Ricketts

Boring, OR

Steve, who is 31, married and has three daughters, is a computer operator for a manufacturing firm and owns two CoCos. He created this New Year treat with BASIC and many hours of drawing, pixel blasting and painting.

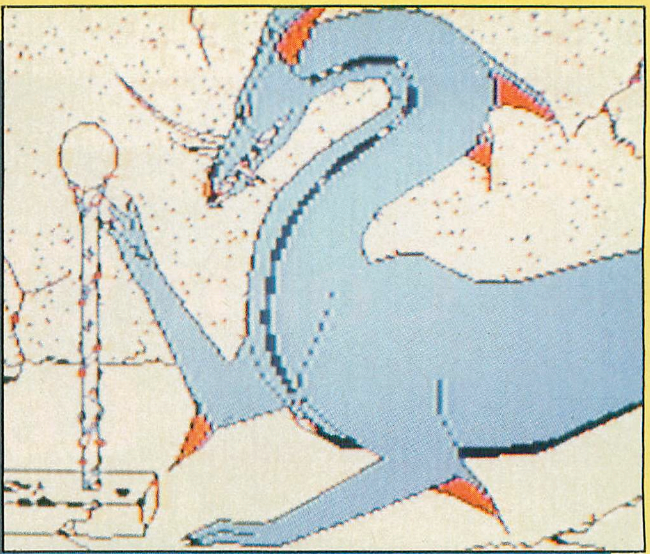
The Enchantment of Chrashk

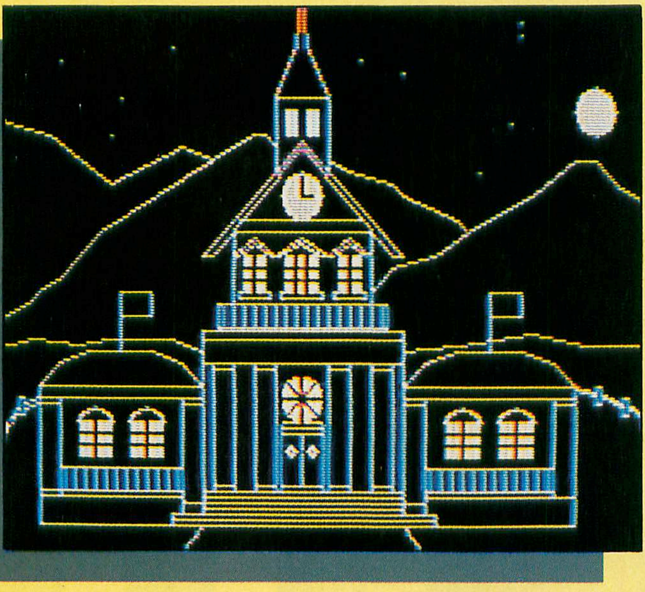
James Olszewski

Rowlett, TX

HONORABLE MENTION

This dragon's lair was created with BASIC, and the help of James' girlfriend. James enjoys electronic synthesizers and computers, and also writes music.





Townhall

Ron Depot

Braintree, MA

HONORABLE MENTION

Ron is a 34-year-old restaurant manager and uses his CoCo to help run the restaurant and as a hobby. *Townhall* was created with BASIC while learning to use the CoCo's `LINE` command.

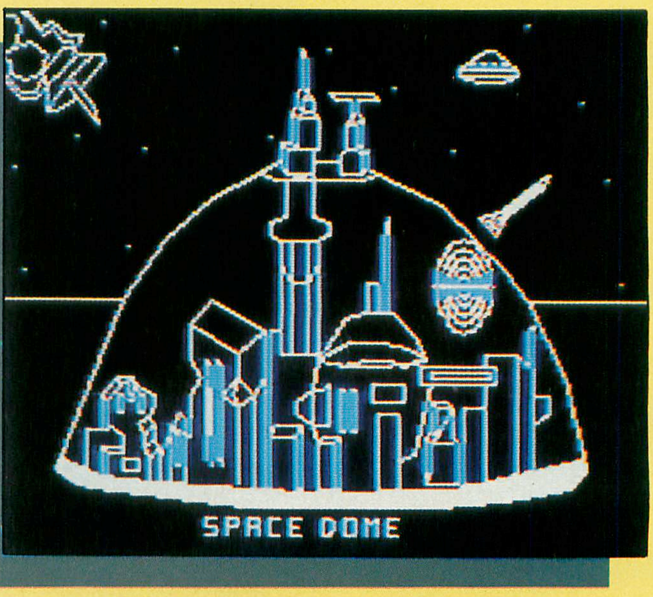
Space Dome

Matt Havlovick

Renton, WA

HONORABLE MENTION

Matt is an eighth grader and has been using his CoCo for five years. *Space Dome* was created with BASIC on a CoCo 3. Besides computing, Matt also enjoys playing the trumpet and piano.



SHOWCASE YOUR BEST!

You are invited to nominate original work for inclusion in upcoming showings of "CoCo Gallery." Share your creations with the CoCo Community!

Be sure to send a cover letter with your name, address and phone number, detailing how you created your picture (what programs you used, etc.) and how to display it. Also, *please* include several facts about yourself, the more the better.

Don't send us anything owned by someone else; this means no game screens, digitized images from TV programs or material that's already been submitted elsewhere. A digitized copy of a picture that appears in a book or magazine is *not* an original work.

We will award a first prize of $25, a second prize of $15 and a third prize of $10. Honorable mentions will also be given.

Jody Doyle, Curator

Send your entry on either tape or disk to:
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THE RAINBOW
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Attn: Jody Doyle

Here's a clever program to display all 64 colors available on the CoCo 3 onscreen at the same time

Color Chart for the CoCo 3

By Rick Adams and Dale Lear

One of the first things new Color Computer 3 users want to do is explore the greatly expanded selection of colors available. Frantically, they flip through the pages of the manual looking for a color chart, or a list of the color codes in numerical order with descriptions of each.

Alas, all that can be found is Sample Program 23 (which shows the colors, eight at a time), and a "color chart" on Page 295 that invites you to run the sample program and "fill in the blanks."

Until now, with the eight colors available on the Color Computer 1 and 2, there has been little ambiguity involved in interpreting the colors. There is no way, other than with a severely mis-adjusted color TV set, or a color-blind observer, that the color red would be mistaken for the color blue, for example.

With the 64 colors now available on the Color Computer 3, however, an element of ambiguity has been introduced. With 64 colors to choose from, there is not only red, there is also light red, dark red, orange-red, red-orange, purplish-red, magenta-red, red-magenta, etc. You get the idea. With so many color shades, each perhaps only slightly different from its neighbor, an element of subjectivity creeps in. As we put it: "One person's light magenta is another's pink." Also, the interpretation of the colors by the video hardware in various TVs may differ due to the adjustment of the tint and color controls, the bandwidth of the TV and many other factors.

So, we suspect that Tandy's "do-it-yourself" color chart was produced to avoid forty zillion phone calls from frantic users wanting to know, "Why does the CoCo 3 color chart in the manual say that Color Code 49 is light cyan, whereas on my TV it is pale blue?"

Don't worry, we have a solution for you. Tandy's Sample Program 23 is 44 lines of BASIC code, and shows eight colors at a time. Our version is 26 lines long (if you don't enter the comments), and shows *all 64 colors on the screen at once!*

Now, we can almost see some of you scratching your heads at this point, and thinking, "Now wait a minute. I know the CoCo 3 is a great machine, but I thought that only 16 colors were available at any one time." Yes, that's true. So, how is it that we can go right ahead and break the rules? The answer is simple: We cheat.

Down at the bottom of the BASIC program listing are a number of DATA statements, containing values that are poked into memory to load a short machine language program. This short program, for which we have provided a separate assembler listing, switches the

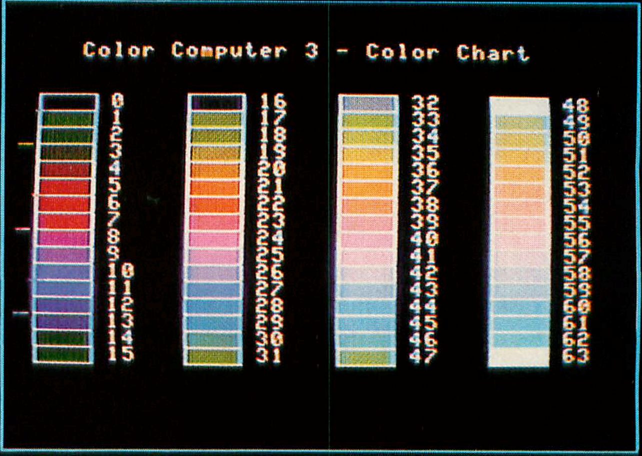
Color Computer 3 - Color Chart

Figure 1: Photograph of composite color monitor

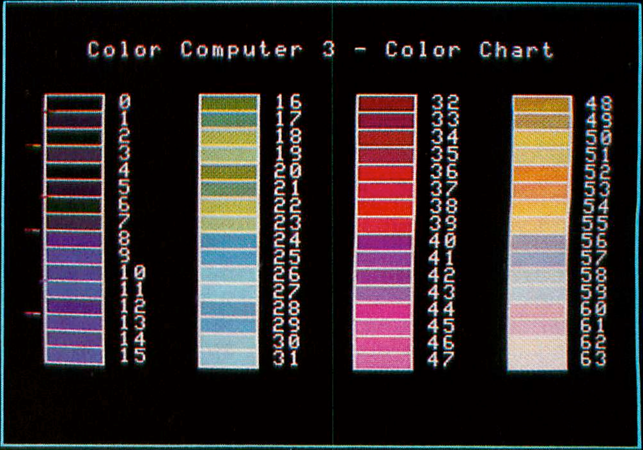
Color Computer 3 - Color Chart

Figure 2: Photograph of analog RGB monitor

Rick Adams is a systems programmer for a company that develops 68000-based systems software. In addition to writing games, he likes science fiction and is the author of Radio Shack's Temple of ROM. *Rick lives in Rohnert Park, California.*

Dale Lear owns Dale Lear Software and makes his living developing programs for the Color Computer. He has authored games and other software such as Double Back, Baseball, TSEDIT, TSWORD *and* D.L. LOGO. *Dale, his wife, Laurel, and their six children live in Petaluma, California.*

The Amazing A-BUS

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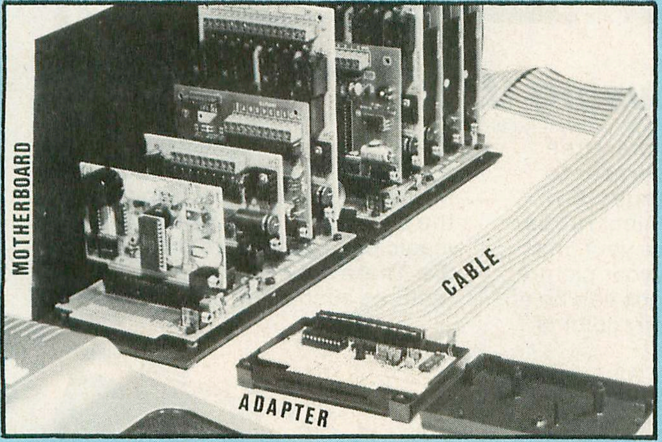

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A-BUS control can be entirely done in simple BASIC or Pascal, and no knowledge of electronics is required!

An A-BUS system consists of the A-BUS adapter plugged into your computer and a cable to connect the Adapter to 1 or 2 A-BUS cards. The same cable will also fit an A-BUS Motherboard for expansion up to 25 cards in any combination.

The A-BUS is backed by Alpha's continuing support (our 11th year, 50000 customers in over 60 countries).

The complete set of A-BUS User's Manuals is available for $10.

About the A-BUS system:

- All the A-BUS cards are very easy to use with any language that can read or write to a Port or Memory. In BASIC, use INP and OUT (or PEEK and POKE with Apples and Tandy Color Computers)
- They are all compatible with each other. You can mix and match up to 25 cards to fit your application. Card addresses are easily set with jumpers.
- A-BUS cards are shipped with power supplies (except PD-123) and detailed manuals (including schematics and programming examples).

Relay Card RE-140: $129

Includes eight industrial relays, (3 amp contacts, SPST) individually controlled and latched. 8 LED's show status. Easy to use (OUT or POKE in BASIC). Card address is jumper selectable.

Reed Relay Card RE-156: $99

Same features as above, but uses 8 Reed Relays to switch low level signals (20mA max). Use as a channel selector, solid state relay driver, etc.

Analog Input Card AD-142: $129

Eight analog inputs. 0 to +5V range can be expanded to 100V by adding a resistor. 8 bit resolution (20mV). Conversion time 120us. Perfect to measure voltage, temperature, light levels, pressure, etc. Very easy to use.

12 Bit A/D Converter AN-146: $139

This analog to digital converter is accurate to .025%. Input range is −4V to +4V. Resolution: 1 millivolt. The on board amplifier boosts signals up to 50 times to read microvolts. Conversion time is 130ms. Ideal for thermocouple, strain gauge, etc. 1 channel. (Expand to 8 channels using the RE-156 card).

Digital Input Card IN-141: $59

The eight inputs are optically isolated, so it's safe and easy to connect any "on/off" devices, such as switches, thermostats, alarm loops, etc. to your computer. To read the eight inputs, simply use BASIC INP (or PEEK).

24 Line TTL I/O DG-148: $65

Connect 24 input or output signals (switches or any TTL device) to your computer. The card can be set for: input, latched output, strobed output, strobed input, and/or bidirectional strobed I/O. Uses the 8255A chip.

Clock with Alarm CL-144: $89

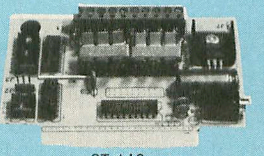
Powerful clock/calendar with: battery backup for Time, Date and Alarm setting (time and date); built in alarm relay, led and buzzer; timing to 1/100 second. Easy to use decimal format. Lithium battery included.

Touch Tone® Decoder PH-145: $79

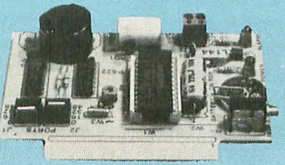
Each tone is converted into a number which is stored on the board. Simply read the number with INP or POKE. Use for remote control projects, etc.

A-BUS Prototyping Card PR-152: $15

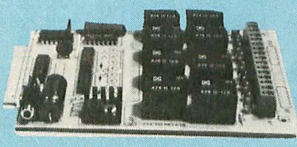
3½ by 4½ in. with power and ground bus. Fits up to 10 I.C.s



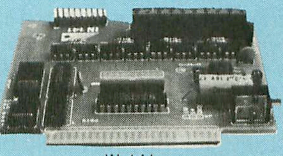
ST-143



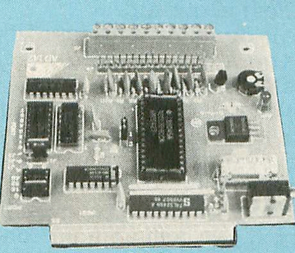
CL-144



RE-140



IN-141



AD-142

Smart Stepper Controller SC-149: $299

World's finest stepper controller. On board microprocessor controls 4 motors simultaneously. Incredibly, it accepts plain English commands like "Move arm 10.2 inches left". Many complex sequences can be defined as "macros" and stored in the on board memory. For each axis, you can control: coordinate (relative or absolute), ramping, speed, step type (half, full, wave), scale factor, units, holding power, etc. Many inputs: 8 limit & "wait until" switches, panic button, etc. On the fly reporting of position, speed, etc. On board drivers (350mA) for small steppers (MO-103). Send for SC-149 flyer.

Remote Control Keypad Option RC-121: $49
To control the 4 motors directly, and "teach" sequences of motions.

Power Driver Board Option PD-123: $89
Boost controller drive to 5 amps per phase. For two motors (eight drivers).

Breakout Board Option BB-122: $19
For easy connection of 2 motors. 3 ft. cable ends with screw terminal board.

Stepper Motor Driver ST-143: $79

Stepper motors are the ultimate in motion control. The special package (below) includes everything you need to get familiar with them. Each card drives two stepper motors (12V, bidirectional, 4 phase, 350mA per phase).
Special Package: 2 motors (MO-103) + ST-143: **PA-181: $99**

Stepper Motors MO-103: $15 or 4 for $39

Pancake type, 2¼" dia, ¼" shaft, 7.5°/step, 4 phase bidirectional, 300 step/sec, 12V, 36 ohm, bipolar, 5 oz-in torque, same as Airpax K82701-P2.

Current Developments

Intelligent Voice Synthesizer, 14 Bit Analog to Digital converter, 4 Channel Digital to Analog converter, Counter Timer, Voice Recognition.

A-BUS Adapters for:

IBM PC, XT, AT and compatibles.	Uses one short slot.	AR-133...$69
Tandy 1000, 1000 EX & SX, 1200, 3000.	Uses one short slot.	AR-133...$69
Apple II, II+, IIe.	Uses any slot.	AR-134...$49
TRS-80 Model 102, 200	Plugs into 40 pin "system bus".	AR-136...$69
Model 100.	Uses 40 pin socket. (Socket is duplicated on adapter).	AR-135...$69
TRS-80 Mod 3,4,4D.	Fits 50 pin bus. (With hard disk, use Y-cable).	AR-132...$49
TRS-80 Model 4P.	Includes extra cable. (50 pin bus is recessed).	AR-137...$62
TRS-80 Model I.	Plugs into 40 pin I/O bus on KB or E/I.	AR-131...$39
Color Computers (Tandy).	Fits ROM slot. Multipak, or Y-cable.	AR-138...$49

A-BUS Cable (3 ft, 50 cond.) CA-163: $24

Connects the A-BUS adapter to one A-BUS card or to first Motherboard.
Special cable for two A-BUS cards: CA-162: $34

A-BUS Motherboard MB-120: $99

Each Motherboard holds five A-BUS cards. A sixth connector allows a second Motherboard to be added to the first (with connecting cable CA-161: $12). Up to five Motherboards can be joined this way to a single A-BUS adapter. Sturdy aluminum frame and card guides included.

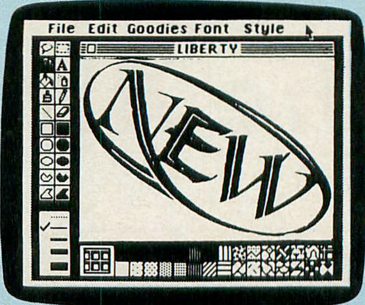
- The A-BUS is not a replacement for the Multi-pak

Add $3.00 per order for shipping.
Visa, MC, checks, M.O. welcome.
NY residents add sales tax.
C.O.D. add $3.00 extra.
Canada: shipping is $5
Overseas add 10%

ALPHA Products
a division of Sigma Industries, Inc.
7904-W Jamaica Avenue, Woodhaven, NY 11421

Technical info: (203) 656-1806
Orders only Except in NY 800 221-0916
New York orders: (718) 296-5916
All lines open weekdays 9 to 5 Eastern time

CoCo Max™ II



You'll use it all the time and love using it.

What is CoCo Max ?

Simply the most incredible graphic and text creation "system" you have ever seen. A Hi-Res Input Pack (more on the pack later) is combined with high speed machine language software. The result will dazzle you.

CoCo Max
CoCo Max
CoCo Max II

CoCo Max disk system, with Y-cable.

Is CoCo Max for you ?

Anyone who has ever held a pencil or a crayon for fun, school or business will love it. A 4 year-old will have fun doodling, a 15 year-old will do class projects and adults will play with it for hours before starting useful applications (illustrations, cards, artwork, business graphics, flyers, charts, memos, etc.) This is one of the rare packages that will be enjoyed by the whole family.

What made CoCo Max an instant success ?

First there's nothing to learn, no syntax to worry about. Even a child who can't read will enjoy CoCo Max. Its power can be unleashed by simply ***pointing*** and ***clicking*** with your mouse or joystick. With ***icons*** and ***pull down menus,*** you control CoCo Max intuitively; it works the same way you think.

Don't be misled by this apparent simplicity. CoCo Max has more power than you thought possible. Its blinding speed will astound you.

It lets you work on an area 3.5 times the size of the window on the screen. It's so friendly that you will easily recover from mistakes: The ***undo*** feature lets you revert to your image prior to the mistake. As usual, it only takes a single click.

Later, we will tell you about the "typesetting" capabilities of CoCo Max II, but first let's glance at a few of its graphic creation tools:

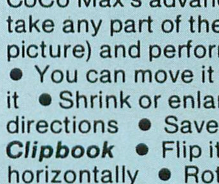
With the ***pencil*** you can draw free hand lines, then use the ***eraser*** to make corrections or changes. For straight lines, the convenient ***rubber-banding*** lets you preview your lines before they are fixed on your picture. It's fun and accurate. Lines can be of any width and made of any color or texture.

The ***paint brush,*** with its 32 selectable brush shapes, will adapt to any job, and make complicated graphics or calligraphy simple.

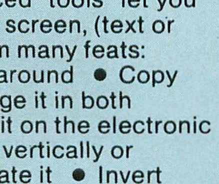
For special effects, the ***spray can*** is really fun: 86 standard colors and textures, all available at a click. It's like the real thing except the paint doesn't drip.

CoCo Max will instantly create many shapes: circles, squares, rectangles (with or without rounded corners), ellipses, etc. Shapes can be filled with any pattern. You can also add hundreds of custom patterns to the 86 which are included.

The ***Glyphics*** are 58 small drawings (symbols, faces, etc.) that can be used as rubber stamps. They're really great for enhancing your work without effort.



Pull down menus



Zoom in !

Control Over Your Work

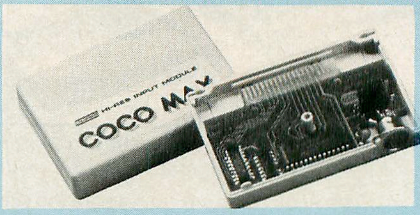
CoCo Max's advanced "tools" let you take any part of the screen, (text or picture) and perform many feats: • You can move it around • Copy it • Shrink or enlarge it in both directions • Save it on the electronic ***Clipbook*** • Flip it vertically or horizontally • Rotate it • Invert it • Clear it, etc. etc.

All this is done instantly, and you can always ***undo*** it if you don't like the results.

For detail work, the ***fat bits*** (zoom) feature is great, giving you easy control over each pixel.

To top it all, CoCo Max II works in color. Imagine the pictures in this ad in color. If you own a Radio Shack CGP-220 or CGP-115, you can even print your work in full color !

There is so much more to say, such as the capability to use CoCo Max images with your BASIC programs, the possibility to use CoCo Max's magic on any standard binary image file. There are also many advanced features such as the incredible ***lasso***.



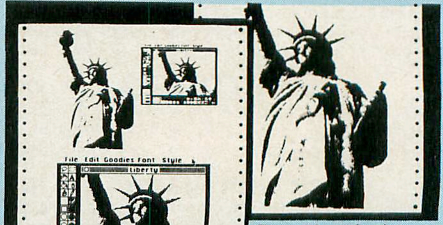
Inside the Hi-Res Input Pack

Why a Hi-Res Input Pack ?

Did you know that the CoCo joystick input port can only access 4096 positions (64x64)? That's less than 10% of the Hi-Res screen, which has 49152 points! (256x192). You lose 90% of the potential. The Hi-Res Input Pack distinguishes each of the 49152 distinct joystick or mouse positions. That's the key to CoCo Max's power. The pack plugs into the rom slot (like a rom cartridge). Inside the pack is a high speed multichannel analog to digital converter. Your existing joystick or mouse simply plugs into the back of the Hi-Res Pack.

Electronic Typesetting...

You'll be impressed with CoCo Max's capability. Text can be added and moved around anywhere on the picture. (You can also rotate, invert and flip it...) At a click, you can choose from 14 built in ***fonts*** each with 16 variations. That's over 200 typestyles !


File Edit Goodies Font Style
Liberty

Examples of printouts

Printing Your Creations

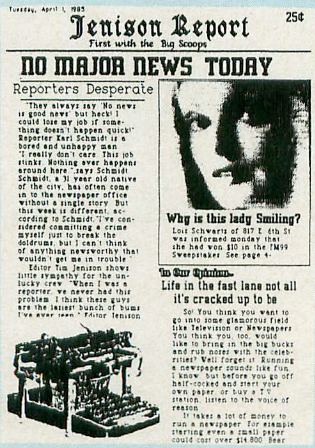
There are a dozen ways to print your work. All are available with a click of your joystick (or mouse) without exiting CoCo Max. Your CoCo Max disk includes drivers for over 30 printers !

All the CoCo Max pictures are **unretouched** screen shots or printouts (Epson RX-80).

CoCo Max II™

The whole family will enjoy CoCo Max. Here are a few examples of the possibilities.

All these pictures are **unretouched** screen photos or printouts (on an Epson RX-80).



Tuesday, April 1, 1985

Jenison Report 25¢

First with the Big Scoops

NO MAJOR NEWS TODAY

Reporters Desperate

"They always say 'No news is good news' but heck! I could lose my job if something doesn't happen quick!" Reporter Karl Schmidt is a bored and unhappy man. "I really don't care. This job stinks. Nothing ever happens around here", says Schmidt. Schmidt, a 31 year old native of the city, has often come in to the newspaper office without a single story. But this week is different, according to Schmidt. "I've considered committing a crime myself just to break the doldrums, but I can't think of anything newsworthy that wouldn't get me in trouble."

Editor Tim Jenison shows little sympathy for the unlucky crew. "When I was a reporter, we never had this problem. I think these guys are the laziest bunch of bums I've ever seen." Editor Jenison

Why is this lady Smiling?

Lois Schwartz of 817 E. 6th St. was informed monday that she had won $10 in the FM99 Sweepstakes. See page 4-

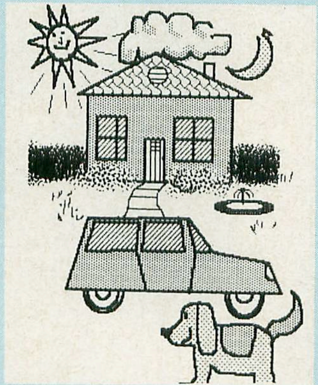
In Our Opinion...

Life in the fast lane not all it's cracked up to be

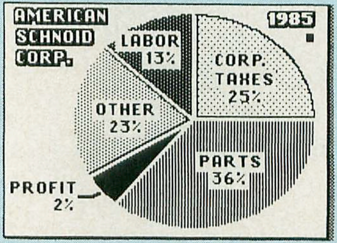
So! You think you want to go into some glamorous field like Television or Newspapers. You think you, too, would like to bring in the big bucks and rub noses with the celebrities? Well forget it. Running a newspaper sounds like fun, I know, but before you go off half-cocked and start your own paper, or buy a T.V. station, listen to the voice of reason.

It takes a lot of money to run a newspaper. For example starting even a small paper could cost over $14,800. Bear

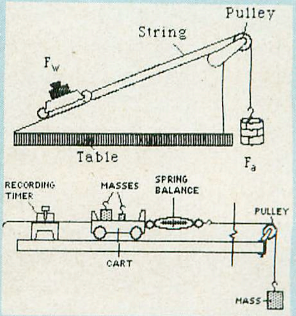
① **Publish a newsletter or bulletin**



② **Fun for children while stimulating creativity.**

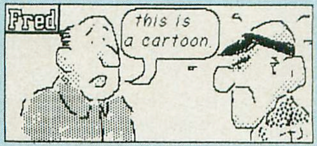


③ **Business graphs, charts, diagrams. Also memos**

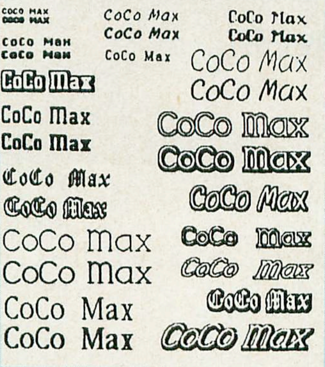


④ **Junior's homework and science projects. Term papers too!**

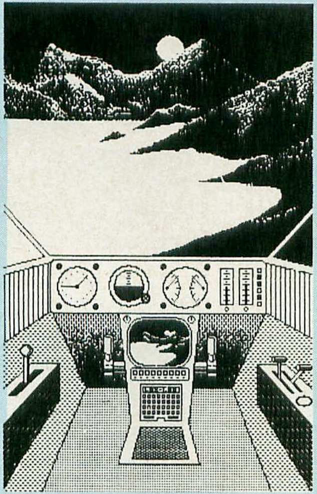
⑦ **Video portrait (with optional digitizer).**



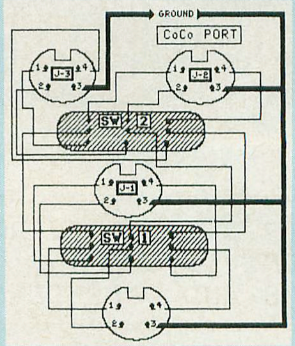
⑧ **This is a cartoon.**



⑤ **Over 200 typestyles to choose from! generate flyers.**



⑥ **A new way to express your imagination.**



⑨ **schematics and floor plans.**

CoCo Max II
CoCo Max II
CoCo Max II
CoCo Max II

⑩ **Logos and letterheads.**

System Requirements:

Any 64K CoCo and a standard joystick or mouse. (The koala pad and the track ball work, but are not recommended.)

Disk systems need a Multi-Pak or our Y-Cable. CoCo Max is compatible with any Radio Shack DOS and ADOS.

Note: the tape version of CoCo Max includes almost all the features of CoCo Max II except *Shrink, Stretch, Rotate,* and *Glyphics.* Also, it has 5 fonts instead of 14.

CoCo Max is not compatible with JDOS, DoubleDOS, MDOS, OS-9, the X-pad, and Daisy Wheel Printers.

Printers Supported:

Epson MX, RX, FX and LX series, Gemini, Star, Micronix, Delta 10, 10X, 15, 15X, SG-10, Okidata 82A, 92, 93, C. Itoh Pro-writer, Apple Image-writer, Hewlett-Packard Thinkjet, Radio Shack DMP 100, 105, 110, 120, 200, 400, 500, Line Printer 7, Line Printer 8, TRP-100, CGP-220. (DMP-130 use Line Printer 8), PMC printers, Gorilla Banana.

Color printing: CGP-200, CGP-115

Pricing

CoCo Max on tape with Hi-Res Pack and manual.	$69.95
CoCo Max II (disk only) with Hi-Res Pack and manual.	$79.95
Upgrade: CoCo Max to CoCo Max II New disk and manual	$19.95

New features of CoCo Max II: 14 fonts and glyphic font, dynamic shrink and stretch, rotate, multiple drive capability, 68 page scrapbook, point and click file load, color printer drivers, full error reporting.

Upgrade: CoCo Max tape to disk manuals, disk and binder	$24.95
Y-Cable: *Special Price*	$19.95
Super Picture Disks #1, #2, and #3 each:	$14.95
All three picture disks	$29.95

Guaranteed Satisfaction

Use CoCo Max for a full month. If you are not delighted with it, we will refund every penny.

Font Editor Option

A font is a set of characters of a particular style. CoCo Max includes 15 fonts. You can create new fonts of letters, or even symbols or graphics with the font editor. Examples: set of symbols for electronics, foreign alphabets, etc. $19.95

Video Digitizer DS-69

This new Low Cost Digitizer is the next step in sophistication for your CoCo Max system. With the DS-69 you will be able to digitize and bring into CoCo Max a frame from any video source: VCR, tuner, or video camera. Comes complete with detailed manual and C-SEE software on disk. Multi-Pak is required.

New Low Price Save $50........ $99.95

New: faster DS-69A.......... $149.95

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C.O.D. add $3.00 extra.
NY and CT: add sales tax.
Shipping to Canada is $5.00
Overseas, FPO, APO add 10%

palette registers as a screen is drawn.

Sixteen times for each time the screen is drawn, the palette registers are reloaded with a new set of values. In this manner, every possible available color can be shown on the same screen. Another nice thing about this color chart is that it clearly shows the relationship between the "intensity" and "color phase" portions of the color values.

The color codes are six-bit values. This means that color codes 0-63 are available. For the composite color set, which is the color set those using a color TV will see, the leftmost two bits in the value are the color intensity, while the four remaining bits are the color phase.

The first column of the color chart shows color values 0 through 15, all of which correspond to color phase 0 through 15, color intensity 0. These colors are so dark that some of them may be indistiguishable from black on your TV, unless you turn up the color brightness.

The next column, which displays color codes 16 through 31, again shows values corresponding to color phase 0 through 15, except that the intensity value is 1. These colors should all be visible, yet somewhat dark.

The third column, displaying colors 32 through 47, contains colors with intensity 2. These colors appear quite bright and vibrant.

The last column, showing colors 48 through 63 (which are colors with intensity level 3), appears so bright that its colors are pastels.

You may notice some small horizontal dashes at the left edge of your TV screen. These dashes appear because the colors generated by the GIME chip in the Color Computer 3 become "unsettled" briefly whenever the contents of the palette registers are changed.

Since the palette registers are being reloaded 16 times per screen refresh (which is 960 times a second), this disturbs the GIME enough to result in this side effect. This is even more noticeable if the high-speed poke is removed from the program. You may have noticed this effect on some video games on the Atari VCS, which uses this same technique to expand the number of available colors. □

Those of you with analog RGB monitors will see a set of colors on your screens that is very different from what one would see on a color TV or a composite color monitor. On a composite monitor, there are 16 distinct colors that are presented at four different luminance levels. For example, the "colors" 8, 16, 24 and 32 are the same color, but 16 is brighter than 8, 24 is brighter than 16 and 32 is brighter than 24. However, the four sets of 16 colors are presented in a very different way on RGB monitors, and the colors in each set no longer have this relationship. Figure 1 shows the colors you see on a color TV or composite monitor (this was photographed from a Panasonic CT-1300D); Figure 2 shows the colors as displayed on Tandy's CM-8 analog RGB monitor.

Why are the colors so different in the two modes? Perhaps the analog RGB output was added after the GIME chip design was already well into the final design stages.

— **Ed Ellers**

Listing 1: `COLOR3`

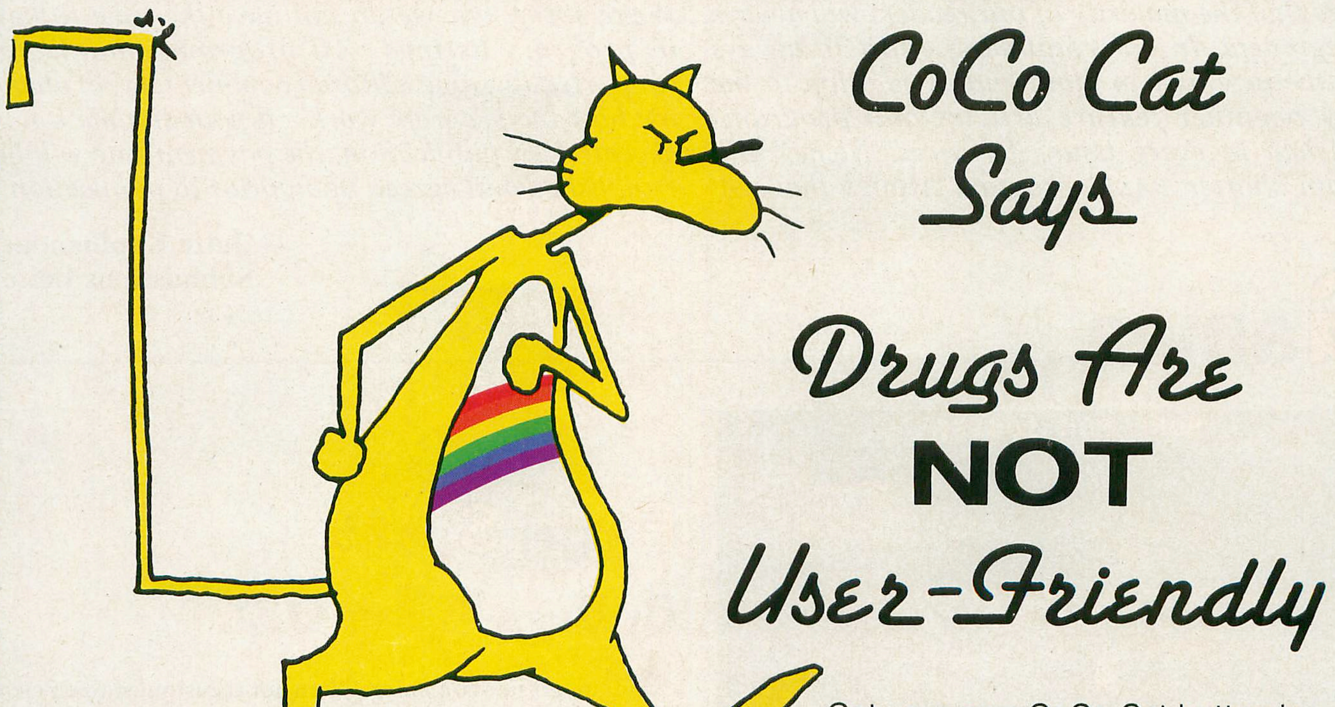
```
10 '============================
20 'COLOR COMPUTER 3 COLOR CHART
30 '       COPYRIGHT 1986
40 ' BY RICK ADAMS AND DALE LEAR
50 '============================
60 '
70 'SET UP PALETTES AND VIDEO
80 '
90 FOR I=0 TO 15:PALETTE I,0:NEX
T I
100 PALETTE 1,63
110 HSCREEN 2
120 '
130 'HIGH-SPEED POKE
140 '
150 POKE &HFFD9,0
160 '
170 'DISPLAY HEADING
180 '
190 HPRINT (4,1),"Color Computer
 3 - Color Chart"
200 '
210 'DRAW BOXES AND NUMBERS
220 '
230 FOR X=0 TO 3 'COLUMNS
240 HLINE (X*80+10,32)-(X*80+40,
160),PSET,B
250 FOR Y=0 TO 15 'ROWS
260 HPRINT (X*10+5,Y+4),X*16+Y
270 HLINE (X*80+10,Y*8+40)-(X*80
+40,Y*8+40),PSET
280 HPAINT (X*80+20,Y*8+36),8+X,
1
290 NEXT Y
300 NEXT X
310 '
320 'POKE IN MACHINE LANGUAGE
330 '
340 FOR I=4096 TO 4160
350 READ A
360 POKE I,A
370 NEXT I
380 '
390 'EXECUTE MACHINE LANGUAGE
400 '
410 EXEC 4096
420 '
430 'DATA FOR MACHINE LANGUAGE
440 'PORTION OF PROGRAM
450 '
460 DATA 26,80,198,46,247,255,3,
134
470 DATA 16,142,0,16,206,32,48,1
98
480 DATA 70,125,255,2,125,255,3,
42
490 DATA 251,125,255,0,125,255,1
,42
500 DATA 251,90,38,245,125,255,0
,125
```

```
510 DATA 255,1,42,251,191,255,18
4,255
520 DATA 255,186,48,137,1,1,51,2
01
530 DATA 1,1,198,7,74,38,218,32,
198
```

Listing 2:

```
                    00010 *========================
                    00020 * CYCLE VERSION 1.0
                    00030 * COPYRIGHT 1986 BY
                    00040 * DALE LEAR AND RICK ADAMS
                    00050 *========================
                    00060
                    00070 * CYCLE THROUGH 16
                    00080 * DIFFERENT PALETTE COMBOS
                    00090 * TIMED WITH THE
                    00100 * HORIZONTAL SYNC
                    00110 * CLOCK, TO YIELD ALL
                    00120 * 64 COLORS ON A SINGLE
                    00130 * SCREEN
                    00140 *
                    00150
1000                00160           ORG     $1000
                    00170
                    00180 * INIT VERT SYNC CLOCK
1000 1A    50       00190 CYCLE     ORCC    #$50
1002 C6    2E       00200           LDB     #$2E
1004 F7    FF03     00210           STB     $FF03
                    00220
                    00230 * SET UP FOR 16 STRIPES
1007 86    10       00240 CYC1      LDA     #16
                    00241
                    00250 * INITIAL PALETTE VALUES
1009 8E    0010     00260           LDX     #$0010
100C CE    2030     00270           LDU     #$2030
                    00271
                    00280 * FIRST STRIPE IS 70 SCAN
                    00290 * LINES DOWN FROM TOP OF
                    00300 * SCREEN
100F C6    46       00310           LDB     #70
                    00311
                    00320 * WAIT FOR VERT SYNC
1011 7D    FF02     00330           TST     $FF02
1014 7D    FF03     00340 CYC2      TST     $FF03
1017 2A    FB       00350           BPL     CYC2
                    00360
                    00370 * WAIT FOR HORIZ SYNC
1019 7D    FF00     00380 CYC3      TST     $FF00
101C 7D    FF01     00390 CYC4      TST     $FF01
101F 2A    FB       00400           BPL     CYC4
                    00401
                    00410 * COUNT STRIPE SCAN LINES
1021 5A             00420           DECB
1022 26    F5       00430           BNE     CYC3
                    00431
                    00440 * WAIT FOR HORIZ SYNC
1024 7D    FF00     00450           TST     $FF00
1027 7D    FF01     00460 CYC5      TST     $FF01
102A 2A    FB       00470           BPL     CYC5
                    00480
                    00490 * CHANGE PALETTE VALUES
102C BF    FFB8     00500           STX     $FFB8
102F FF    FFBA     00510           STU     $FFBA
                    00520
                    00530 * BUMP PALETTE VALUES
1032 30    89 0101  00540           LEAX    $0101,X
1036 31    C9 0101  00550           LEAY    $0101,U
                    00551
                    00560 * STRIPES ARE 8 SCAN
                    00570 * LINES HIGH
103A C6    07       00580           LDB     #7
                    00581
                    00590 * COUNT NUMBER OF STRIPES
103C 4A             00600           DECA
103D 26    DA       00610           BNE     CYC3
                    00611
                    00620 * LAST STRIPE, GO DO IT
                    00630 * AGAIN
103F 20    C6       00640           BRA     CYC1
                    00650
           1000     00660           END     CYCLE

00000 TOTAL ERRORS
```



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These fun "quickies" help ease the newcomer into the amazing world of computing

It's Only The Beginning

The new Color Computer owner buys his/her versatile machine for its graphics and music capabilities, organization of their home and office, educational purposes — both in the home and school and to acquire programming knowledge — and some, simply for pure fun and entertainment.

As far as the CoCo is concerned, the more you learn, the more you realize how little you actually know. That is why every session at the keyboard is an adventure in learning.

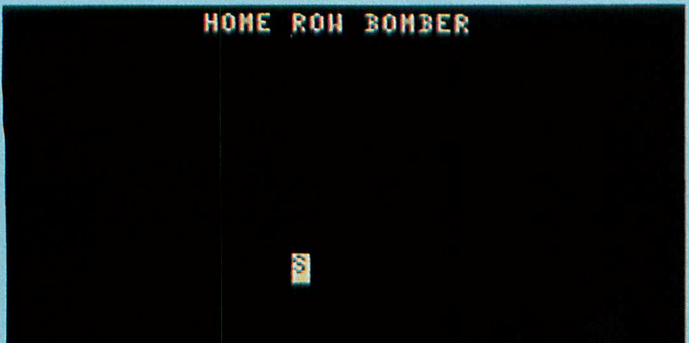
THE RAINBOW is a teaching environment and we realize that the majority of our readers will always be beginners. In our continuing effort to always keep the new user in mind and in addition to the many beginner feature articles and programs published in every issue, "Novices' Niche" will contain shorter BASIC program listings that will entertain and help the new user gain expertise in all aspects of the Color Computer: graphics, music, games, utilities, education, programming, etc.

Contributions to "Novices' Niche" are welcome from everyone. We like to run a variety of short programs that can be typed in at one sitting and will be useful, educational and fun. Keep in mind, although the short programs are limited in scope, many novice programmers find it enjoyable and quite educational to improve the software written by others.

Program submissions must be on tape or disk. We're sorry, but we do not have the time to key in program listings. All programs should be supported by some editorial commentary, explaining how the program works. If your submission is accepted for publication, the payment rate will be established and agreed upon prior to publication.

— Jutta Kapfhammer
Submissions Editor

Games



16K ECB

Finger Sprints

By Bruce K. Bell, O.D.

Computer newcomers are often not accustomed to efficient typing methods and yet will spend hours entering programs from the keyboard. *Home Row Bomber* provides a fun way to develop and sharpen typing skills, even for the most experienced typist.

Upon running the program, a fleet of eight battleships will appear on the blue water in the lower screen. Pressing a number (1-9) starts the game at the skill level chosen. Using

Level 1, only the "home row" keys will be used (A, S, D, F, G, H, J, K, L, ;). As higher levels are reached or selected, additional keys are added.

After a level is chosen, letters will descend toward the ships in the water. Press the letter on the keyboard corresponding to the letter on the screen and the letter will explode. However, if the letter reaches your battleships first, one battleship will be destroyed for each missed letter. After each 25 letters are destroyed, the level increases by one, which allows additional letters to descend at a faster rate. At the higher skill levels as many as 10 letters will fall simultaneously at rapid speeds, requiring liberal use of the SHIFT key.

The game ends when all eight ships are destroyed or 20 letters reach the water. A game may be aborted by pressing the SHIFT and down arrow keys simultaneously. The score up to that point will then be displayed.

The listing: HOME ROW

```
0 'HOME ROW BOMBER 1.0; (C) 1986
 BRUCE BELL
5 POKE359,57
10 L$="JFKDLS;AHGURIEOWPQYTMV,C.
X/ZNB7483920l:-@!#$%&'()=?><+":P
OKE282,1
20 CLS0:PRINT@8,"home"CHR$(128)"
row"CHR$(128)"bomber";:FORK=0TO9
:S(K)=0:NEXT:M=0:H=0
30 FORY=28TO31:FORX=0TO63:SET(X,
Y,3):NEXTX,Y:FORK=1TO8:C=(RND(5)
+2)*16:S$=CHR$(129+C)+CHR$(135+C
)+CHR$(135+C)+CHR$(131+C):PRINT@
412+K*4,S$;:NEXT:PRINT@480,"scor
e";:PRINT@500,"level";:GOSUB130
40 PRINT@32," PRESS (1-9) FOR ST
ARTING LEVEL":I$=INKEY$:IFI$="Q"
THEN170ELSEL=VAL(I$):IFL<1THEN40
ELSEFORK=32TO63:PRINT@K,CHR$(128
);:NEXT:SC=0:GOSUB130
50 FORK=0TO9
60 IFS(K)>0THEN90ELSEIFRND(DL)>1
THEN120
70 L$(K)=MID$(L$,RND(LL),1):S(K)
=1
80 P(K)=32+RND(128)-1:IFPEEK(P(K
)+1024)<>128ORPEEK(P(K)+1056)<>1
28THEN80
90 IFS(K)=0THEN110ELSEPRINT@P(K)
,CHR$(128);:P(K)=P(K)+32:PK=PEEK
(P(K)+1024):PRINT@P(K),L$(K);
100 IFP(K)>415THENS(K)=0:PRINT@P
(K),"*";:SOUND100,1:PRINT@P(K)AN
D4092,CHR$(128)CHR$(128)CHR$(128
)CHR$(128);:M=M+1:IFM=20THEN20EL
SEIFPK<>128THENH=H+1:IFH=8THEN20
110 Q$=INKEY$:IFQ$=""THEN120ELSE
IFQ$="["THEN20ELSEFORQ=0TO9:IFS(
Q)=0THENNEXTQ ELSEIFQ$<>L$(Q)THE
NNEXTELSES(Q)=0:POKEP(Q)+1024,42
:SOUND200,1:PRINT@P(Q),CHR$(128)
;:SC=SC+2:PRINT@486,SC;:S=SC/100
:IFS=INT(S)THENL=L+1:GOSUB130
120 NEXTK:GOTO50
130 LL=L*9:IFLL>54THENLL=54
140 DL=91-L*10:IFDL<1THENDL=1:PO
KE65495,0ELSEPOKE65494,0
150 SCREEN0,(L+1)AND1
160 PRINT@486,SC*L"  ";:PRINT@50
6,L;:RETURN
170 POKE359,126:POKE282,255:CLS4
:PRINT"BYE BYE!":END
```

4K

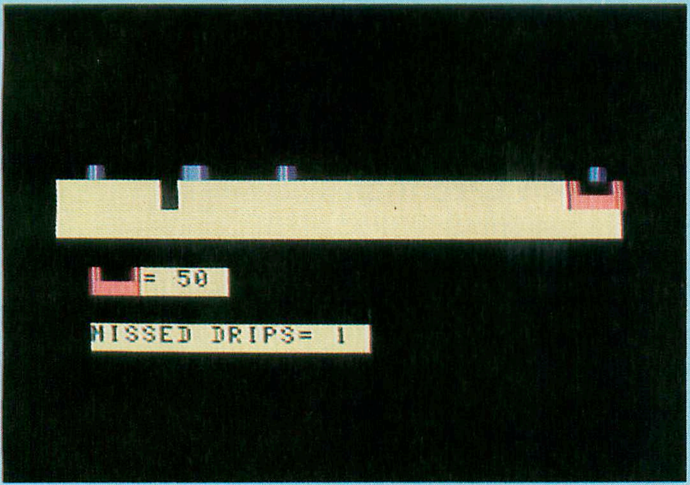
Wet 'N' Wild

By James E. Rittenhouse

The Leaky Roof game is one which combines eye-hand coordination and a little luck.

Using the A and L keys, move the red bucket under the water dripping from the ceiling to achieve a catch. Ten points are awarded for each drip caught. Your score and the number of drips missed are displayed just below the floor, and missing five drips ends the game.

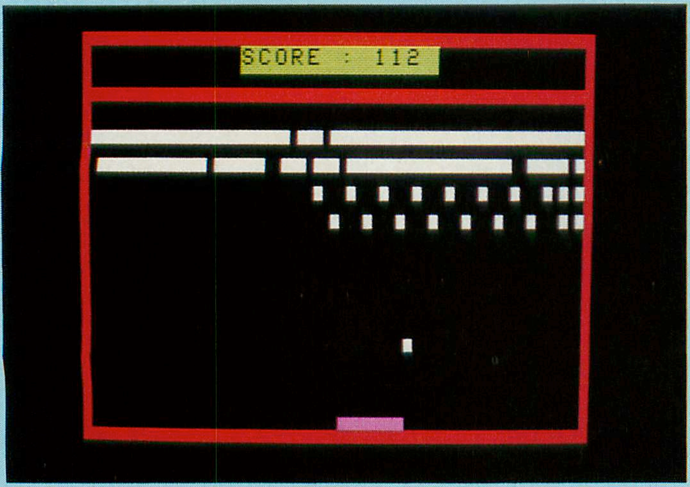
Try not to get all wet!



```
= 50
MISSED DRIPS= 1
```

The listing: LEAKY

```
10 REM*THE LEAKY ROOF GAME
20 REM*BY J.E.RITTENHOUSE
22 CLS
25 GOSUB 600
30 PRINT:PRINT"******THE LEAKY R
OOF GAME******"
40 PRINT:PRINT"DIRECTIONS:"
50 PRINT"USE THE RED BUCKET TO C
ATCH THE"
55 PRINT"DRIPS AND SCORE POINTS.
IF YOU"
60 PRINT"MISS FIVE DRIPS (THEY'R
E REALLY"
70 PRINT"BIG DRIPS) THE GAME IS
OVER."
80 PRINT:PRINT"PRESS [A] TO MOVE
 LEFT AND"
85 PRINT"PRESS [L] TO MOVE RIGHT
."
90 PRINT:GOSUB 660
95 PRINT:INPUT"PRESS [ENTER] TO
BEGIN";ST$
100 T=0:B=0:F=288
105 CLS(0)
107 FOR H=1TO61:SOUND 50,3:H=H+R
ND(50)
109 IF H>61 THEN H=61
110 FOR V=1 TO 31
115 SET(H,V,3)
120 IF V=17 AND F=288+INT(H/2) T
HEN GOTO 128
122 IF V=17 AND F=288+INT(H/2)-1
 THEN GOTO 128
124 IF V=17 AND F=288+INT(H/2)-2
 THEN GOTO 128
125 GOTO 129
128 SOUND 100,3:SOUND 75,2:GOSUB
 400:GOTO 107
129 GOSUB 300
130 RESET(H,V)
140 NEXT V
150 B=B+1:IF B=5 THEN GOTO 500
155 PRINT@450,"MISSED DRIPS=";B;
160 NEXT H
165 GOTO 107
300 C=128+16*(4-1)+11:D=128+16*(
4-1)+3:E=128+16*(4-1)+7
310 IF F<288 THEN F=288
315 IF F>317 THEN F=317
320 PRINT@F,CHR$(C);CHR$(D);CHR$
(E)
330 A$=INKEY$:IF A$=""THEN RETUR
N
335 IF A$="A"OR A$="L"THEN GOTO
340 ELSE RETURN
340 IF A$="L"THEN PRINT@F,"":F=F
+RND(10):GOTO 315
350 IF A$="A"THEN PRINT@F,"":F=F
-RND(10):GOTO 310
400 T=T+10
410 PRINT@386,CHR$(C);CHR$(D);CH
R$(E);"=";T;
430 FOR X=1TO1000:NEXT X
440 RETURN
500 CLS:PRINT@288,"THE WATER'S U
P TO YOUR EARS NOW.BETTER STOP B
EFORE YOU DROWN."
505 PRINT:PRINT"YOUR SCORE WAS "
;T
510 PRINT:INPUT"PLAY AGAIN (Y OR
 N)";P$
520 IF P$="Y"THEN GOTO 10 ELSE E
ND
600 G=128+16*(4-1)+6
610 FOR X=0TO31
620 PRINT@0+X,CHR$(G);
640 NEXT X
650 RETURN
660 FOR X=0TO31
670 PRINT@416+X,CHR$(G);
680 NEXT X
690 RETURN
```



4K

A Visit To The Past

By Allen Drennan

Backstabber 1986 is similar to the old Breakout games first available for the CoCo 1 and is a great game for beginners.

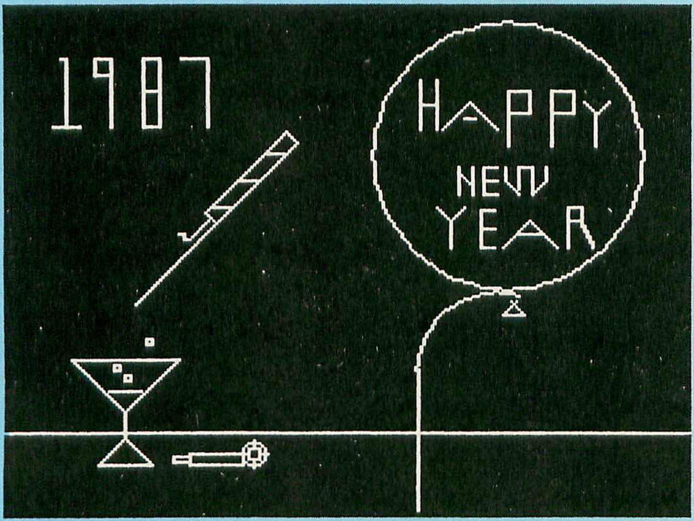
You need a joystick to play. Start by bouncing the ball off your paddle and the four layers of blocks. If the ball hits the ground below your paddle you lose a man. Three men are given at the start of the game and the CoCo keeps score. To win you must clear the entire board of blocks or reach a score of 240.

The listing: BACKSTAB

```
100 ' BACKSTABBER 1986
110 '
120 ' ALLEN DRENNAN
130 ' 1986 COLOR CLOUD
140 ' 19506-D INDUSTRIAL DR.
150 ' SONORA, CA. 95370
160 ' (209) 533-8489
170 '
180 CLS0
190 E$=CHR$(227)+CHR$(227)+CHR$(
227)+CHR$(227):F$=CHR$(128)+CHR$
(128)+CHR$(128)+CHR$(128)
```

```
200 MN=3:RO=3:OO=3:RL=3:BX=60:BY
=15:SX=1:SY=1
210 FOR J=2 TO 61
220 SET(J,5,4):SET(J,1,4)::SET(J
,30,4):SET(1,INT(J/2),4):SET(62,
INT(J/2),4)
230 NEXT J
240 FOR J=8 TO 14 STEP 2
250 FOR I=2 TO 61
260 SET(I,J,5)
270 NEXT I:NEXT J
280 PRINT @ 448+OO,F$;
290 PRINT @ 448+RL,E$;
300 OO=RL
310 RL=INT(JOYSTK(0)/2)
320 IF RL>27 THEN RL=27
330 IF RL<1 THEN RL=1
340 IF BX=2 OR BX=61 THEN SX=-SX
350 IF BY=6 THEN SY=-SY
360 IF BY<>29 THEN 390
370 SOUND 100,8:RESET(BX,BY):BX=
60:BY=15:SX=1:SY=1:MN=MN-1
380 IF MN=0 THEN RUN ELSE 280
390 RESET(BX,BY):BX=BX+SX:BY=BY+
SY
400 IF BX>61 THEN BX=61
410 IF BX<2 THEN BX=2
420 IF POINT(BX,BY)=7 THEN 430 E
LSE 450
430 SOUND 150,1:SY=-SY:BY=BY-1:A
=RND(2):IF A=1 THEN SX=-1 ELSE S
X=1
440 GOTO 280
450 IF POINT(BX,BY)=0 THEN 490
460 SOUND 1,1:CO=CO+1:IF CO=240
THEN 200
470 PRINT @ 42,"SCORE :";CO;
480 SY=-SY:GOTO 390
490 SET(BX,BY,5)
500 GOTO 280
```

Graphics



16K
ECB

Happy New Year!

By Carmie A. Thomas

The following program draws New Year's graphics and plays a familiar tune.

Happy New Year to all!

The listing: NEW YEAR

```
5 PMODE4,1
10 PCLS:SCREEN1,1
20 CIRCLE(188,56),50
30 DRAW"BM156,28;D18U9R6U9D18U9B
R10BD9BL8E10F10BL8BU4L4BR16U10D2
0U20R8D8L8R8BR8U8D20U20R8D8L8R8B
R8D12U12H4BR9G4BD20BL60
40 DRAW"BM170,60;D10BU10BR5D10U3
H4BR8U3D10R5BU5L5BU5R5BR8BD10H5U
5BR5D8U8R5D10E5U5BD15BL40F5E5G5D
10BR11U14R5BD7L5D7R5BR3E10F10BL5
BU5L10BR19U10D15U15R5D5L5R5D2R1D
2R1D2R1D2R1D2R1D2BD20BL30F5L8E5BG36D
40U50D53
50 CIRCLE(184,136),30,1,1,.50,.8
0
60 DRAW"BM24,20;S5L2R2D20L4R8BR1
0U20L5D5R5BR10U5D20R5U11L5U10R5D
10BR7BU10R8D20
70 DRAW"BM0,160;R250
80 DRAW"BM36,172;S8R10H5G5E5U5H1
0R20G10BU4L3R6L3BU3R1D1L1U1BL2BU
2R1D1L1U1BU5BR6R1D1L1U1
90 DRAW"BM70,168;R10D2L10U2":DRA
W"BM70,169;L3D1R3
100 CIRCLE(94,168),5:CIRCLE(94,1
68),3
110 DRAW"BU40G10E30H2G15F2H1G4L1
U1L1R1BE5R4E5L4E5R4
200 G=147:C=176:E=193:D=185
210 SOUNDG,5:SOUNDC,5:SOUNDC,7:S
OUNDC,5:SOUNDE,5:SOUNDD,5:SOUND1
```

```
76,5:SOUNDD,5:SOUNDE,5:SOUNDD,5:
SOUNDC,5:SOUNDC,5:SOUNDE,5:SOUND
204,5:SOUND210,5:SOUND210,5:SOUN
D204,5:SOUND193,5:SOUND193,5:SOU
NDC,5:SOUNDD,5:SOUNDC,5:SOUNDD,5
:SOUNDE,5:SOUNDD,5:SOUNDC,5
240 :SOUND159,5:SOUND159,5:SOUND
147,5:SOUND176,5
1000 GOTO1000
```

16K
ECB

PEEKasso Prints

By Keiran Kenny

Peekasso is a simple drawing program that uses `PEEK(135)` and the keyboard. The arrow keys are used to move up, down, left and right. The W key is used to move north-east, the S key to move south-east, the Q to move north-west and the A for south-west. A pixel is set at the center of the screen and by pressing the appropriate key, the trace will continue drawing in the required direction. Press another directional key and the trace will change direction without stopping. To stop movement, press any key except 1, 2, 3 or 4.

The 1 key will give you a flashing cursor which can be moved to any location using the direction keys. The 2 key will restore the pixel for drawing at the new location. To erase a line, press 1 and go back in the direction from which you came. And, if you run into the edge of the screen, the trace stops and wait for another directional key to be pressed.

To save a masterpiece, press the play and record buttons on the cassette recorder and then press 3. To load a previously saved picture, position the tape in the appropriate position and press 4. A flashing cursor will appear at the top-left corner of the screen when the loading is complete.

The listing: PEEKASSO

```
0 'PEEKASSO':BY KEIRAN KENNY,
  THE HAGUE, 1986.
10 PMODE4,1:COLOR0,5:PCLS:SCREEN
1,1
20 X=128:Y=96
30 PSET(X,Y,0):GOTO50
40 P=PEEK(135)
50 IFP=94THENY=Y-1
60 IFP=10THENY=Y+1
70 IFP=8THENX=X-1
80 IFP=9THENX=X+1
90 IFP=65THENX=X-1:Y=Y+1
100 IFP=81THENX=X-1:Y=Y-1
110 IFP=87THENX=X+1:Y=Y-1
120 IFP=83THENX=X+1:Y=Y+1
130 IFX<0THENX=0:POKE135,0
140 IFX>255THENX=255:POKE135,0
150 IFY<0THENY=0:POKE135,0
160 IFY>191THENY=191:POKE135,0
170 IFP=49THENC=5
180 IFP=50THENC=0
190 IFP=51GOSUB240
200 IFP=52GOSUB250
210 IFC=5THENCIRCLE(X,Y),1,0:CIR
CLE(X,Y),1,C:GOTO230ELSEPSET(X,Y
,C)
220 FORD=1TO100:NEXT
230 GOTO40
240 POKE135,0:CSAVEM"",PEEK(&HBA
)*256,PEEK(&HB7)*256-1,&HB44A:X=
0:Y=0:C=5:RETURN
250 PCLS:POKE135,0:CLOADM:X=0:Y=
0:C=5:RETURN
```

16K
ECB

Astronomer's Heaven

By Robie Kressman

The following program will display six big dippers in the night sky. If you would like to change screen colors, change Line 15 to: `15 SCREEN 1,0`. You can also change Line 55 to: `55 GOTO 5` and the dippers will blink on and off.

The listing: BIGDIPPR

```
1 ' *** DIPPER ***
2 ' BY ROBIE KRESSMAN
5 PMODE 4,1
10 PCLS
15 SCREEN 1,1
20 DRAW  "BM60,60R60G15NL30GL30G
H50L30GH50L30U20FR30U20
25 DRAW  "BM170,60R60G15NL30GL30
GH50L30GH50L30U20FR30U20
30 DRAW  "BM180,60R60G15NL30GL30
GH50L30GH50L30U20FR30U20
40 DRAW  "BM190,60R60G15NL30GL30
GH50L30GH50L30U20FR30U20
45 DRAW  "BM160,60R60G15NL30GL30
GH50L30GH50L30U20FR30U20
50 DRAW  "BM200,60R60G15NL30GL30
GH50L30GH50L30U20FR30U20
55 GOTO 55
```

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Utilities

4K

Songwriter's Word Rhymer

By Bill Bernico

Whether you're a poet, a songwriter or just a wise guy who needs to come up with a rhyming word, the following program may suit your needs.

All you have to do is type in the word you are trying to rhyme and the CoCo will display 65 combinations of words, 13 at a time, that rhyme with it. Granted, not all 65 words will be valid words, or even words that make sense. However, if the list contains even one word that helps finish your poem, it's done its job.

The listing: RHYMER

```
10 'SONGWRITER'S WORD RHYMER
20 'FROM KROMICO SOFTWARE
30 'BY BILL BERNICO
40 '
50 CLS:INPUT"WORD TO RHYME";W$
60 T$=MID$(W$,2,LEN(W$)):CLS
70 FOR R=1 TO 65:READ R$
80 PRINT R$+T$
90 IF R=13 OR R=26 OR R=39 OR R=
52 OR R=65 THEN GOSUB 120
100 NEXT:RUN
110 DATA A,B,BL,BR,C,CH,CL,CR,D,
DR,E,F,FL,FR,G,GR,H,I,J,K,KL,L,M
,MIN,MIS,N,O,OB,P,PH,PHO,PHY,PL,
PR,PRA,PRE,PRO,PSY,QU,R,S,SC,SCH
,SH,SK,SL,SM,SN,SP,ST,STR,SQU,SW
,T,TH,THR,TR,U,V,W,WH,WR,X,Y,Z
120 PRINT:PRINT@452,"HIT ANY KEY
 TO CONTINUE
130 IF INKEY$=""THEN 130
140 RETURN
```

16K
ECB

Teacher's Pet

By Christine Terrio

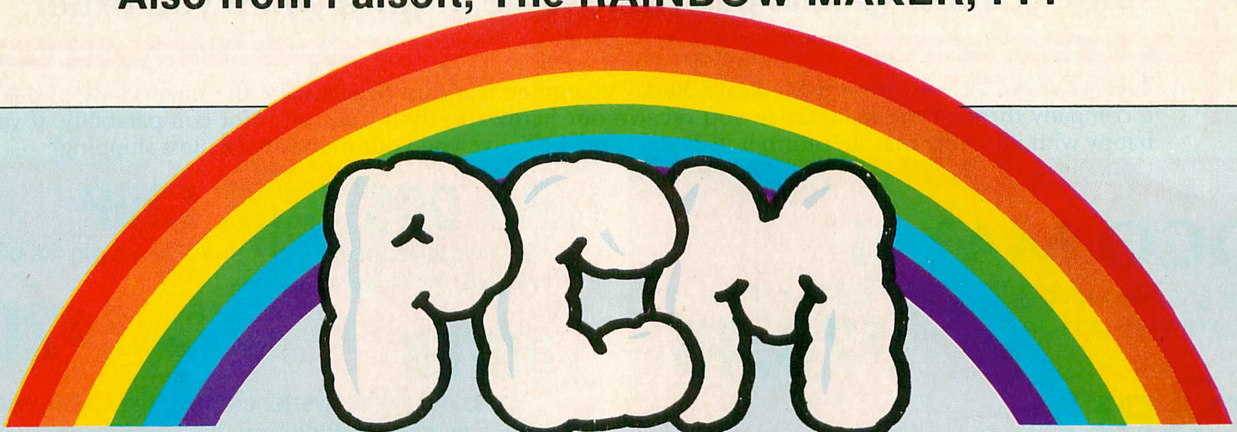
Spelling Worksheet Generator is a simple program that will print a spelling word list of up to 20 words to aid students in handwriting practice of words on spelling tests.

To replace the words with your own, change the data statements in lines 1000, 1010, 1020 and 1030. The elongated or double-wide printer codes are located in Line 75, and are turned off in Line 115. The baud rate is set to run on the Olivetti ink-jet printer at 2400 baud.

The listing: SPELPRAC

```
5 'SPELPRAC
10 'BY CHRISTINE TERRIO 11/85
15 CLS:PRINT "PRESS (BREAK) AND
LOAD YOUR OWN"
20 PRINT "WORDS INTO DATA LINES.
 START AT  LINE 1000"
25 PRINT "USE ONLY 5 WORDS IN EA
CH DATA   LINE"
30 PRINT "THEN RUN AGAIN"
35 PRINT"PRESS ENTER TO CONTINUE
";BK$
40 INPUT BK$
45 IF INKEY$ = " " THEN 50
50 CLS:PRINT"SET PRINTER AT 2400
 BAUD"
55 PRINT"THEN PRESS (ENTER)";X$
60 INPUT X$
65 POKE 150,18
70 CLS:PRINT @288,"PRINTING"
75 PRINT#-2,CHR$(27);CHR$(51)
80 PRINT#-2,"NAME";STRING$(24,95
);"DATE";STRING$(8,95)
85 PRINT#-2,"WRITE EACH WORD 4 O
R 5 TIMES";STRING$(2,13)
90 FOR X= 1 TO 20 STEP 1
95 READ A$
100 PRINT#-2,A$+STRING$(40-LEN(A
$),95);STRING$(2,13)
105 NEXT X
110 RESTORE
115 PRINT#-2,CHR$(27);CHR$(52)
120 CLS:PRINT"DO YOU WANT ANOTHE
R? (Y/N)"
125 PRINT"IF YES,POSITION PRINTE
R AT THE  TOP OF THE NEXT PAGE";
Y$
130 INPUT Y$
135 IF Y$="Y" THEN GOTO 70
140 IF Y$<>"Y" THEN END
1000 DATA REWARD, RECESS, RESULT
, RECORD, RECITE
1010 DATA REMAIN, REFUSE, REPLY,
 RESPECT, REMEMBER
1020 DATA REMIND, RETURN, REJECT
, REPEAT, REMAINDER
1030 DATA REVIEW, RECEIVE, REMOV
E, RELIEF, RECEIPT
1040 DATA END
```

Also from Falsoft, The RAINBOW MAKER, . . .



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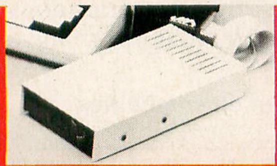

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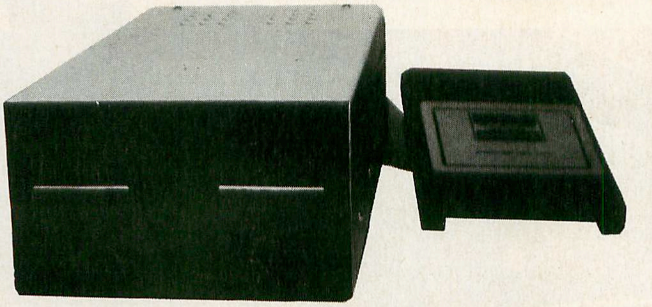

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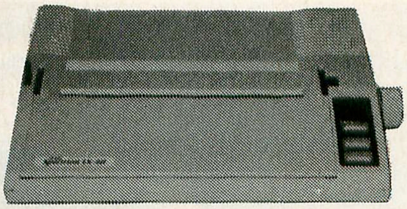

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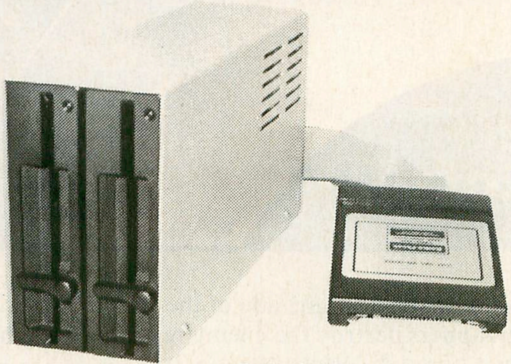

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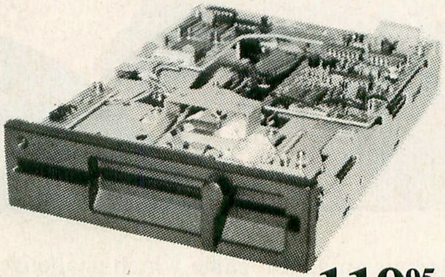

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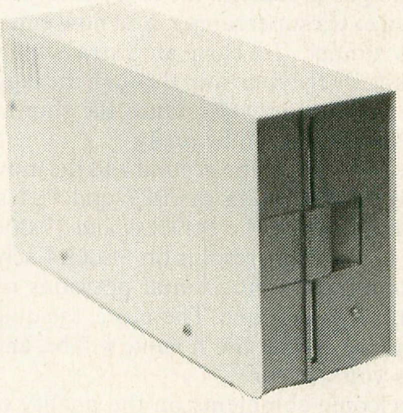

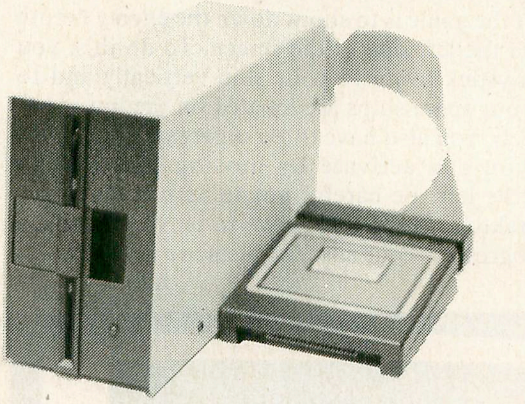

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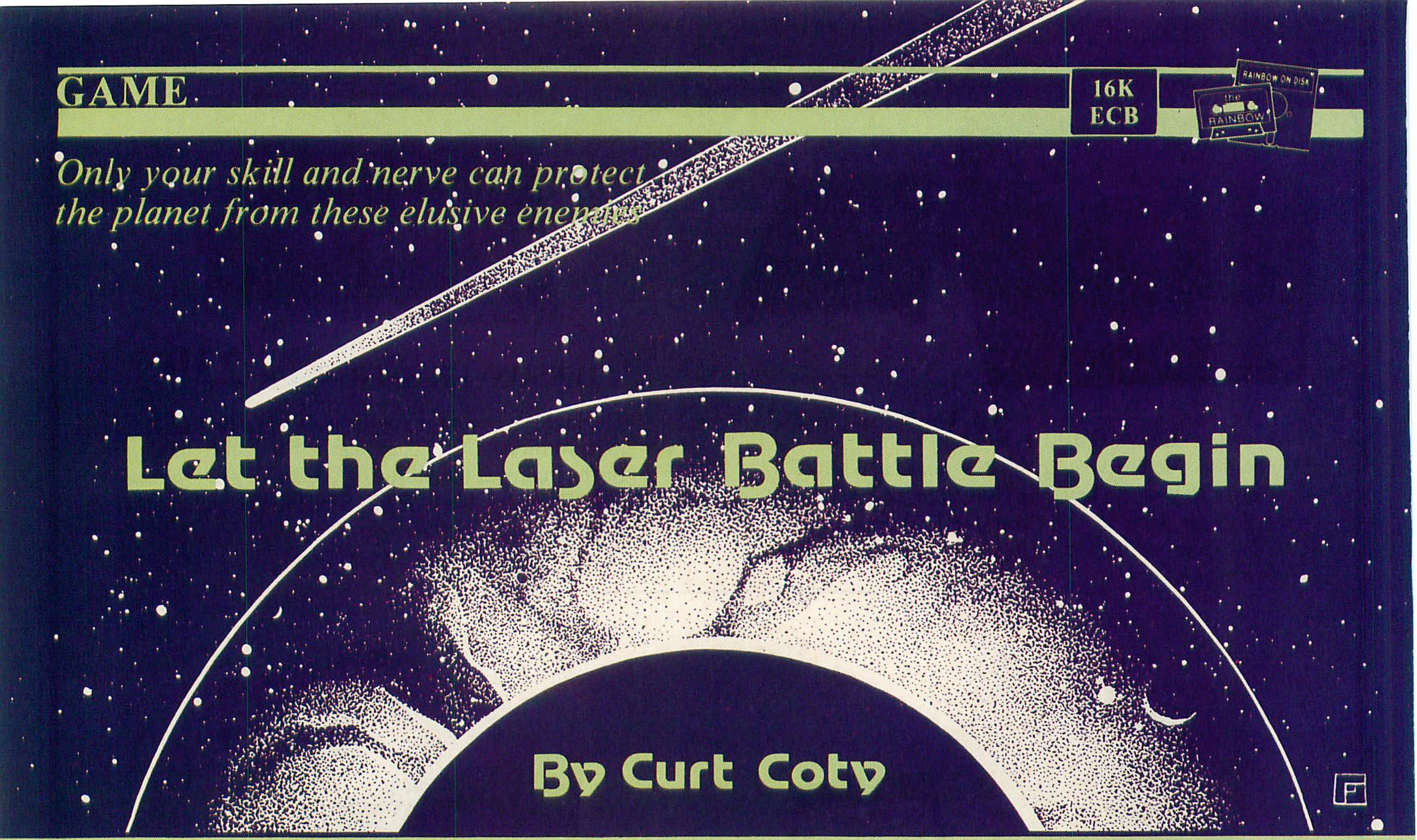


Let the Laser Battle Begin

By Curt Coty

Def Mov is an action game which challenges you to defend your home planet against the enemy. After loading and running *Def Mov*, a low resolution title screen appears while the computer sets up the graphics screen. When the game board appears, the computer plays a short tune and the ground begins to scroll by as you fly your ship over the blue soil. Press the right joystick button to begin your battle against the enemy.

The object of the game is to shoot down the enemy before his ship reaches the left side of the screen. To do this, you use the right joystick to move your ship vertically and to fire the laser. Your spare ships are located on the lower-left part of the screen. You also have three superzappers in your arsenal that you can activate by moving the joystick completely to the left. Be careful not to activate a superzapper by mistake, for they will prove to be very valuable as the game progresses. Your superzappers are the z-shaped lines on the lower-right side of the screen. When activated, superzappers destroy the enemy regardless of where he is.

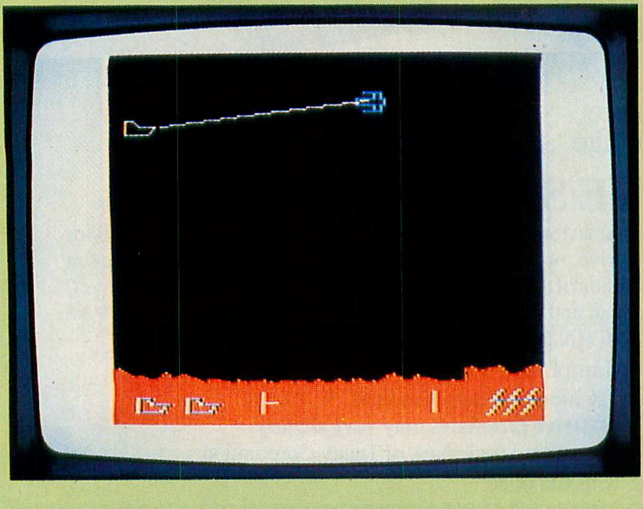
The enemy attacks in waves of 10, and beginning with the fourth wave they begin to shoot back at you. With each new wave, the enemy becomes faster and harder to hit.

Located in the lower center of the screen is your enemy casualty gauge. When you shoot down about 35 enemies and the gauge reaches the full mark, you have a chance to earn an extra superzapper. You now enter what is called the bonus tunnel. To earn an extra superzapper you must successfully fly your ship through the jagged tunnel without crashing into the walls. Once the ship has started moving you can't stop it, so be ready.

The scrolling of the ground and the movement of the ships are all created using the `GET` and `PUT` statements. I used combinations of the `PMODE4` and `PMODE3` screens to add color to the high resolution `PMODE4` screen. Score is kept by summing the horizontal positions of the enemy ships each time you hit one. Therefore, the quicker you shoot the enemy, the greater the X value will be, and in turn, the more points you will earn.

I welcome comments on the quality of my program, or perhaps suggestions on improving the play. I am only familiar with BASIC language, however. Good luck and have fun!

(Questions or comments about this game may be addressed to Curt at 4072 Eleven Mile Rd., Auburn, MI 48611. Please enclose an SASE when writing.) ☐



Curt Coty attends college in Michigan, and is pursuing a degree in electrical engineering. A self-taught programmer, Curt also enjoys sports.

```
250 ......231
460 ......198
690 ......246
870 ......198
1120 ......13
1340 ......151
1580 ......201
1770 ......238
END ......57
```

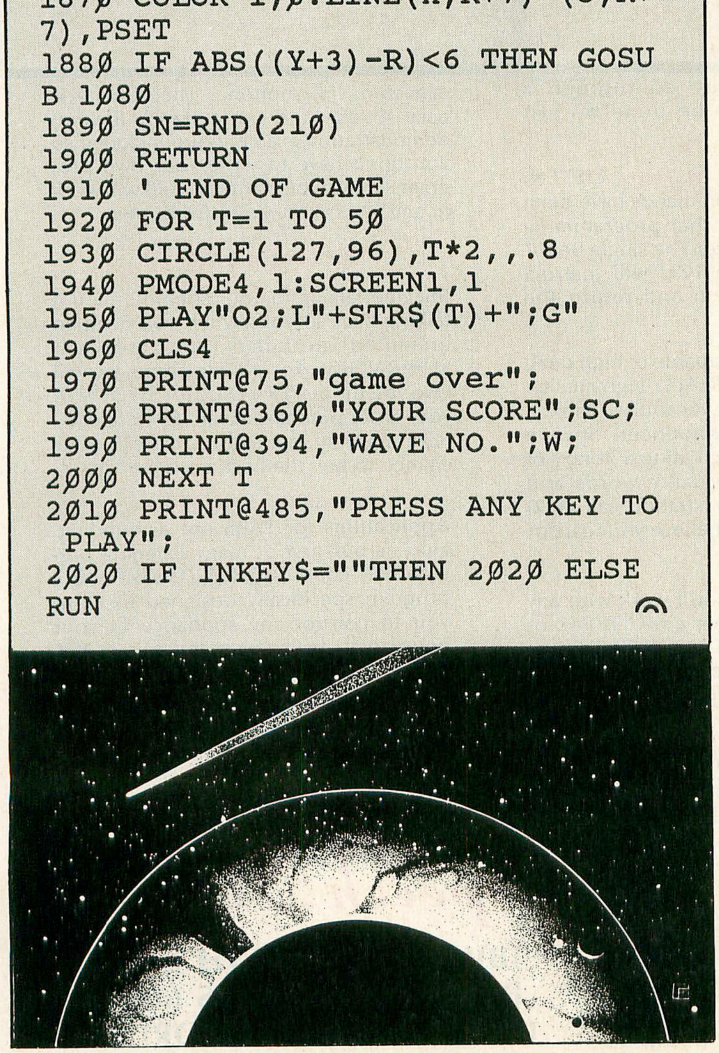
The listing: DEF MOV

```
10 'DEF MOV BY CURT COTY  10/24/
86
20 POKE 65495,0
30 CLS4
40 PRINT@1,STRING$(30,"*");
50 PRINT@481,STRING$(30,"*");
60 PRINT@237,"def mov";
70 PRINT@362,"by curt coty";
80 SCREEN0,1
90 DIM BG(245,10),SG(10,10)
100 PMODE4,1:PCLS0
110 DRAW"BM9,50;U7;R5;F3;R10;G4;
L13
120 ' DRAW GROUND
130 PMODE3,1:COLOR2,1:G=165
140 FOR T=0 TO 255
150 R=RND(3):G=G+(R-2)
160 IF G<160 THEN G=160 ELSE IF
G>170 THEN G=170
170 PSET(T,G):NEXT T:PAINT(0,190
)
180 'DRAW SUPERZAPPERS
190 DRAW"BM230,175;C3;G5;R5;G7
200 DRAW"BM240,175;C3;G5;R5;G7
210 DRAW"BM250,175;C3;G5;R5;G7
220 'DRAW RESERVE SHIPS
230 DRAW"BM15,185;C3;U7;R5;F3;R1
0;G4;L13
240 DRAW"BM45,185;C3;U7;R5;F3;R1
0;G4;L13
250 'DRAW ENEMY GUAGE
260 DRAW"BM190,175;C0;D10
270 DRAW"BM90,175;C0;D10
280 GOSUB 360
290 SOUND1,5
300 RUN 310
310 DIM SH(25,25):GET(5,35)-(30,
60),SH
320 DIM MT(35,20):GET(100,100)-(
135,120),MT
330 DIM EN(30,15)
340 GOSUB 580
350 GOTO 450
360 ' GROUND SCROLLING ROUTINE
370 SCREEN1:POKE 65314,248
380 PLAY"O3L16AO4CO3DO4CO3AO4CO3
AO4CO3DO4CO3AO4CO3L16BO4CDCO3BAG
ABAGF#EF#GF#EDC#DEDC#O2BABAGF#GA
BO3C#DO2BAGF#EL8D"
390 GET(0,160)-(10,170),SG
400 GET(10,160)-(255,170),BG
410 PUT(0,160)-(245,170),BG
420 PUT(245,160)-(255,170),SG
430 IF PEEK(65280)=126 OR PEEK(6
5280)=254 THEN RETURN
440 GOTO 390
450 'MAIN LOOP
460 X=220:LL=90:ES=2:Y=35:SZ=230
:SL=45:NO=0:SC=0:W=1:SN=-20
470 A=JOYSTK(0):B=JOYSTK(1)
480 IF PEEK(65280)=126 OR PEEK(6
5280)=254 THEN GOTO 830
490 IF B>53 THEN Y=Y+3 ELSE IF B
<10 THEN Y=Y-3
500 IF Y>135 THEN Y=135 ELSE IF
Y<0 THEN Y=0
510 PUT(5,Y)-(30,Y+25),SH
520 PUT(X,R)-(X+30,R+15),EN,PSET
530 X=X-ES
540 IF X<10 THEN GOSUB 1080
550 IF A=0 THEN GOSUB 920
560 IF ABS(SN-X)<15 THEN GOSUB 1
830
570 GOTO 470
580 ' FIRST ENEMY
590 NE=0
600 COLOR 3,1
610 DRAW"BM228,100;D2;R10;D3;L5;
R10;U3;R2;U3;L2;U3;L10;R5;D3;L10
;D1
620 GET(223,93)-(253,108),EN,G
630 R=93:W=W+1:ES=ES+1:IF ES>8 T
HEN ES=8
640 CLS4:PRINT@298,"score";SC;:P
RINT@266,"wave no.";W;
650 FOR T=1 TO 2000:NEXT T:PMODE
4,1:SCREEN1:POKE 65314,248
660 RETURN
670 ' SECOND ENEMY
680 COLOR 3,1
690 DRAW"BM228,100;E5;R10;D2;L4;
G3;F3;R4;D2;L10;H5
700 GET(225,93)-(255,108),EN,G
710 R=93:ES=ES+1:W=W+1:IF ES>8 T
HEN ES=8
720 CLS4:PRINT@298,"score";SC;:P
RINT@266,"wave no.";W;
730 FOR T=1 TO 2000:NEXT T:PMODE
4,1:SCREEN1:POKE 65314,248
740 RETURN
750 ' THIRD ENEMY
760 COLOR 3,1
770 DRAW"BM226,100;D2;R20;U3;L20
;D1;U1;R8;E3;R7;D9;L7;H3
780 GET(225,93)-(255,108),EN,G
```

```
790 W=W+1:R=93:ES=ES+1:IF ES>8 T
HEN ES=8
800 CLS4:PRINT@298,"score";SC;:P
RINT@266,"wave no.";W;
810 FOR T=1 TO 2000:NEXT T:PMODE
4,1:SCREEN1:POKE 65314,248
820 RETURN
830 'SHOOTING ROUTINE
840 PMODE3,1:COLOR 2,1
850 LINE(30,Y+11)-(255,Y+11),PSE
T
860 PLAY"T255;L255;BBBBGGGEEC
870 COLOR1,0:LINE(30,Y+11)-(255,
Y+11),PSET
880 ES=ES+.5:IF ES>8 THEN ES=8
890 NO=NO+1:IF NO>12 THEN NO=12
900 IF ABS((Y+3)-R)<6 THEN GOSUB
 1200
910 GOTO 510
920 'SUPERZAPPER ROUTINE
930 IF SZ=260 THEN RETURN
940 PMODE4,1:COLOR 1,0
950 LINE(30,Y+11)-(X+15,R+7),PSE
T
960 FOR T=1 TO 50
970 PLAY"T255;A;B;C
980 SCREEN1:PMODE3,1
990 PLAY"T255;D;E;F
1000 SCREEN1:PMODE4,1
1010 NEXT T
1020 PMODE4,1:SCREEN1:COLOR 0,1:
POKE 65314,248:LINE(30,Y+11)-(X+
15,R+7),PSET
1030 PMODE3,1:DRAW"BM"+STR$(SZ)+
",175;C2;G5;R5;G7
1040 SZ=SZ+10
1050 PUT(X,R)-(X+30,R+15),MT,PSE
T
1060 GOSUB 1200
1070 RETURN
1080 'ENEMY REACHES LEFT SIDE
1090 PLAY"T5;L200;O5;BAGFEC;O3;B
AGFEC;O1;BAGFEC;L1;C
1100 FOR T=1 TO 400:NEXT T
1110 IF SL=-15 THEN 1910
1120 PLAY"T100;L100;O2;BBAAGGFFE
ECCEFGAB
1130 DRAW"BM"+STR$(SL)+",185;C2;
U7;R5;F3;R10;G4;L13
1140 PUT(5,Y)-(35,Y+20),MT
1150 PUT(X,R)-(X+35,R+20),MT
1160 R=RND(140):X=220
1170 PLAY"O3
1180 SL=SL-30
1190 RETURN
1200 'SHIP HITS ENEMY
1210 PUT(X,R)-(X+35,R+15),MT
1220 PUT(X,R)-(X+20,R+15),EN
1230 PLAY"T255;L255;BBCCBBCCBBCC
```

```
1240 PUT(X,R)-(X+35,R+15),MT
1250 SC=SC+INT(X)
1260 ES=ES-(NO*.5):NO=0
1270 R=RND(140):X=220
1280 NE=NE+1:IF NE=10 THEN GOSUB
 670 ELSE IF NE=20 THEN GOSUB 75
0 ELSE IF NE=30 THEN GOSUB 580
1290 LL=LL+3
1300 PMODE3,1:PSET(LL,180,0):PSE
T(LL-1,180,0):PSET(LL-2,180,0)
1310 IF LL>186 THEN SOUND 10,10:
GOSUB 1350
1320 SC=SC+INT(X)
1330 IF W>3 THEN SN=RND(210)
1340 RETURN
1350 'BONUS TUNNEL ROUTINE
1360 PUT(5,Y)-(35,Y+20),MT
1370 CLS4:PRINT@225,"prepare to
enter bonus tunnel";
1380 PRINT@298,"score";SC;
1390 PMODE4,1:COLOR 1,0
1400 LINE(0,70)-(20,90),PSET
1410 LINE(0,128)-(20,108),PSET
1420 I=90
1430 FOR P=20 TO 255
1440 R=RND(3):I=I+(R-2)
1450 IF I<80 THEN I=80 ELSE IF I
>100 THEN I=100
1460 PSET(P,I,1):PSET(P,I+18,1)
1470 NEXT P
1480 SH$="U7;R5;F3;R10;G4;L13
1490 DRAW"BM0,100;"+SH$
1500 SCREEN1:POKE 65314,248:I=10
0:SOUND100,10
1510 FOR X=0 TO 1500:NEXT X:SOUN
D 200,1
1520 DRAW"BM0,100;C0;"+SH$
1530 FOR P=0 TO 235 STEP 2
1540 A=JOYSTK(0):B=JOYSTK(1)
1550 IF B>53 THEN I=I+1 ELSE IF
B<10 THEN I=I-1
1560 DRAW"BM"+STR$(P)+","+STR$(I
)+"C1"+SH$
1570 IF PPOINT(P+6,I-8)=1 OR PPO
INT(P+15,I)=1 OR PPOINT(P+19,I-4
)=1 THEN 1650
1580 DRAW"BM"+STR$(P)+","+STR$(I
)+"C0"+SH$
1590 NEXT P
1600 FOR T=1 TO 20:PLAY"T255;L55
;CEFGAB":NEXT T
1610 CLS4:PRINT@229,"**bonus sup
erzapper**";
1620 SZ=SZ-10
1630 PMODE3,1:DRAW"BM"+STR$(SZ)+
",175;C3;G5;R5;G7"
1640 GOTO 1700
1650 'SHIP CRASHED
1660 DRAW"BM"+STR$(P+9)+","+STR$
```

```
(I-3)+";G5;E10;G5;H5;F10;H5;L5;R
10;L5;U5;D10
1670 SOUND 1,20
1680 FOR T=1 TO500:NEXT T
1690 CLS4:PRINT@268,"no bonus";
1700 COLOR 0,1
1710 PMODE4,1
1720 DRAW"BM"+STR$(P+9)+","+STR$
(I-3)+";C0;G5;E10;G5;H5;F10;H5;L
5;R10;L5;U5;D10
1730 COLOR 1,0
1740 LINE(0,70)-(255,70),PSET
1750 LINE(0,128)-(255,128),PSET
1760 PAINT(0,90),1,1:PAINT(0,90)
,0,0
1770 PMODE3,1:COLOR 6,1
1780 LINE(92,180)-(189,180),PSET
1790 LL=90
1800 PMODE3,1:SCREEN1:POKE 65314
,248
1810 R=RND(140):X=220
1820 RETURN
1830 ' ENEMY SHOOTS AT SHIP
1840 PMODE3,1:COLOR 3,1
1850 LINE(X,R+7)-(5,R+7),PSET
1860 PLAY"T100;L255;CCCCACCCCA"
1870 COLOR 1,0:LINE(X,R+7)-(5,R+
7),PSET
1880 IF ABS((Y+3)-R)<6 THEN GOSU
B 1080
1890 SN=RND(210)
1900 RETURN
1910 ' END OF GAME
1920 FOR T=1 TO 50
1930 CIRCLE(127,96),T*2,,.8
1940 PMODE4,1:SCREEN1,1
1950 PLAY"O2;L"+STR$(T)+";G"
1960 CLS4
1970 PRINT@75,"game over";
1980 PRINT@360,"YOUR SCORE";SC;
1990 PRINT@394,"WAVE NO.";W;
2000 NEXT T
2010 PRINT@485,"PRESS ANY KEY TO
 PLAY";
2020 IF INKEY$=""THEN 2020 ELSE
RUN
```



Now Create Your Own Signs, Banners, and Greeting Cards.

Introducing The Coco Graphics Designer

Last Christmas we introduced our COCO Greeting Card Designer program (see review April 86 Rainbow). It has been so popular that we've now expanded it into a new program called the COCO Graphics Designer. The Coco Graphics Designer produces greeting cards plus banners and signs. This program will further increase the usefullness and enjoyment of your dot matrix printer.

The Coco Graphics Designer allows you to mix text and pictures in all your creations. The program features picture, border, and character font editors, so that you can modify or expand the already built in libraries. Plus a special "grabber" utility is included to capture areas of high resolution screens for your picture library.

Requirements: a Coco or Coco II with a minimum of 32K, One Disk Drive (Disk Ext. BASIC 1.0/1.1,ADOS, or JDOS). Printers supported include: Epson RX/FX, GEMINI 10X, SG-10, NX-10, C-Itoh 8510, DMP-100/ 105/ 400/ 430, Seikosha GP-100/250, Legend 808 and Gorilla Bannana. Send a SASE for complete list of compatible printers.
#C332 Coco Graphics Designer $29.95

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TOP
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- SPEECH RECOGNITION
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- HIGH QUALITY SPEECH REPRODUCTION

EARS Does It All!

INCREDIBLE!

Two Years In the Making. Speech Systems was formed to develop new and innovative speech products. After 2 years of intensive Research and Development, we have created a truely sophisticated speech recognition device. Recognition rates from 95% to 98% are typical. Until now, such a product was outside the price range of the personnel computer market, and even small businesses.

EARS is trained by your voice and capable of recognizing any word or phrase. Training EARS to your particular voice print takes seconds. Up to 64 voice prints may be loaded into memory. You may then save on tape or disk as many as you like so that your total vocabulary is virtually infinite.

Speech and Sound Recognition. EARS is really a sound recognition system, so it really doesn't matter whether you speak in English, Spanish, or French. In fact you do not have to speak at all, you can train EARS to understand sounds such as a musical note or a door slamming.

Hands Off Programming. Imagine writing your own BASIC programs without ever touching the keyboard. Everything that you would normally do through a keyboard can now be done by just speaking.

Programming EARS Is Easy. LISTEN, MATCH and other commands have been added to BASIC so that programming EARS is a piece of cake! The single BASIC line: 10 LISTEN: MATCH will instruct EARS to listen to you and return the matching phrase.

It Talks. EARS is also capable of high quality speech. We mean REALLY high quality. The speech is a fixed vocabulary spoken by a professional announcer. Speech Systems is currently creating a library of thousands of high quality words and phrases. For a demonstration call **(312) 879-6844**, you won't believe your ears or our EARS.

DISK OWNERS. EARS will work with any disk system with either a MULTI-PAK or Y-CABLE. Our new Triple Y-CABLE was specifically developed for those wishing to add SUPER VOICE as a third device.

You Get Everything You Need. You get everything you need including a specially designed professional headset style noise cancelling microphone. The manual is easy to use and understand. Several demonstration examples are included so you don't have to write your own programs unless you want to. EARS will work in any 32K or 64K Color Computer.

SUPER VOICE $20 OFF

Imagine talking to your computer and it talking back to you. When you need an unlimited vocabulary, you can't beat SUPER VOICE. For a limited time, we will give you the SUPER VOICE for $59.95 with your EARS purchase. Even if you already have another speech unit, here is your chance to buy the best and save $20.

VOICE CONTROL

Applications for EARS are astounding. Here is our first of many listening programs to come. VOICE CONTROL is a program specifically designed to allow you to control any appliance in your house with your voice and our HOME COMMANDER (sold separately) or the Radio Shack Plug 'N' Power controller. For example, you can control your TV by saying "TV ON" or "TV OFF". . **$24.95**

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only . . . $59.95

musical applications of microprocessors

CoCo 3 Compatible

SUPER VOICE is no ordinary speech synthesizer. It uses Silicon Systems, Inc. SSI-263, the most advanced speech/sound chip available. SUPER VOICE is not only capable of highly intelligible speech, sound effects, and singing over a 6 octave range, but now we have turned SUPER VOICE into a monophonic Super Music Synthesizer with our PIANO KEYBOARD.

IT TALKS. A free TRANSLATOR text-to-speech program makes writing your own talking program as easy as SAYING "HELLO."

SUPER VOICE works in any 32K or 64K computer. A disk system requires a Y-Cable or Multi-Pak.

FREE "REACTION" To Test Your Reflexes

FREE SUPER VOICE SINGS THE STAR SPANGLED BANNER

FREE "SIMON" To Test Your Memory

Here are the facts; the decision is yours.

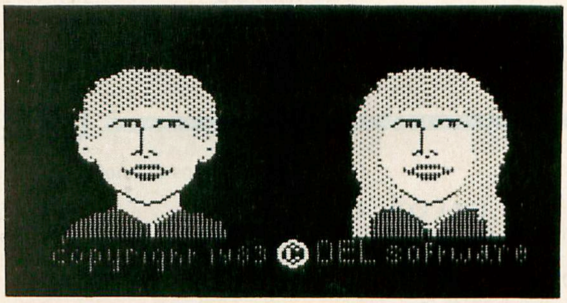
	SUPER VOICE	REAL TALKER	RS SPEECH CARTRIDGE	VOICE-PAK
Synthesizer Device	SSI-263	SC-01	SP-256	SC-01
Speaking Speeds	16	1	1	1
Volume Levels	16	1	1	1
Articulation Rates	8	1	1	1
Vocal Tract Filter Settings	255	1	1	1
Basic unit of Speech	64 phonemes 4 durations each	64 phonemes	64 allophones 5 pause lengths	64 phonemes
Pitch Variations	4096 (32 absolute levels with 8 inflection speeds)	4	1	4

SAVE $24.95

FREE

SUPER TALKING HEADS

Paul and Pauline, our talking heads program is normally $24.95. Until Dec. 15 we will include them with each SUPER VOICE order.



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1 MEGABYTE COLORAMA

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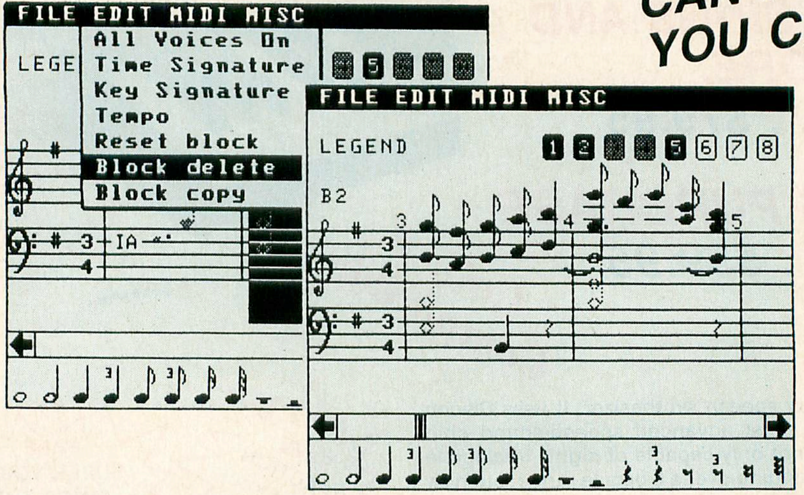
CoCo 3 Compatible

IF YOU CAN POINT, YOU CAN COMPOSE

PULL DOWN MENUS

ICONS!

A MUST FOR MIDI USERS



LYRA is the most powerful music composition program we have seen on any computer. We don't mean just the COCO, we really mean any computer. Whether you are a novice trying to learn music or a professional musician with MIDI equipment you will find LYRA a powerful tool. You see, we wrote LYRA for musicians that hate computers. If you want proof, purchase a LYRA demo for $7.95. We will apply the demo price to your purchase. MIDI output requires the LYRA MIDI cable (#MC158) or COCO MIDI Seq/Editor (#CM147).

- Ultra Easy to use, just point with joystick or mouse and click.
- Compose with up to 8 completely independent voices.
- Room for over 18,000 notes. (This is not a misprint!)
- Super Simple Editing Supports:
  - Note insert
  - Note delete
  - Note change
  - Block insert
  - Block delete
  - Block copy
- Output music to:
  - TV Speaker
  - STEREO PAK
  - SYMPHONY 12
  - MIDI Synth
  - Monitor Speaker
  - ORCHESTRA 90
  - COCO MIDI S/E
  - MIDI Drum Machine
- Output up to 4 voices without additional hardware.
- Output all 8 voices using either SYMPHONY 12 or one or more MIDI synthesizers and drum machines.
- Output any voice on any of the 8 MIDI channels.
- Transpose music to any key.
- Modify music to any tempo.
- Automatically inserts bar for each measure as you compose.
- Key signature lets you specify sharps and flats only once, LYRA will do the rest.
- Plays MUSICA 2 files using LYRA CONVERT (#LC164).
- Each voice may be visually highlighted or erased.
- Each measure is numbered for easy reading.
- Solo capability
- Block edits are highlighted.
- Tie notes together for musical continuity.
- Name of note pointed to is constantly displayed.
- Jump to any point in the score instantaneously.
- Memory remaining clearly displayed, however you will have plenty of memory even for the most demanding piece.
- Help menu makes manual virtually unnecessary.
- LYRA is 100% software, no need for extra hardware unless you want more power.
- Music easily saved to tape or disk.
- Requires 64K and mouse or joystick.

LYRA (Disk only) #LY122 . . . . **$54.95**

LYRA OPTIONS

These LYRA options are **not** required. They are provided for those wishing additional flexibility.

LYRA CONVERT

A program to convert MUSICA 2 files to LYRA files.
(T or D) #LC164 . . . . **$14.95**

LYRA STEREO ENHANCER

Gives the LYRA stereo output when used with the STEREO PAK or ORCHESTRA 90.
(T or D) #LS149 . . . . **$14.95**

LYRA MIDI CABLE

A cable to connect your computer to your MIDI synthesizer.
#MC158 . . . . **$19.95**

LYRA SYMPHONY 12 ENHANCER

Lets LYRA play all 8 voices through SYMPHONY 12.
(T or D) #LS177 . . . . **$19.95**

STEREO PAK

Plugs into the COCO ROM cartridge slot allowing easy connection to your stereo system.
#SP193 . . . . **$39.95**

SYMPHONY 12

A real hardware music synthesizer, lets LYRA play all 8 voices in stereo.
(T or D) #SY149 . . . . **$69.95**

COCO MID Seq/Editor

A professional quality MIDI interface for MIDI synthesizers.
(Disk only) #CM147 . . . . **$149.95**

MUSIC LIBRARY

A collection of over 800 songs. When used with CONVERT, it gives an incredible LYRA library. Each volume 100 songs.
(T or D) #MLXXX **$29.95**

COCO MAX is a trademark of Colorware.
ORCHESTRA 90 is a trademark of Radio Shack.

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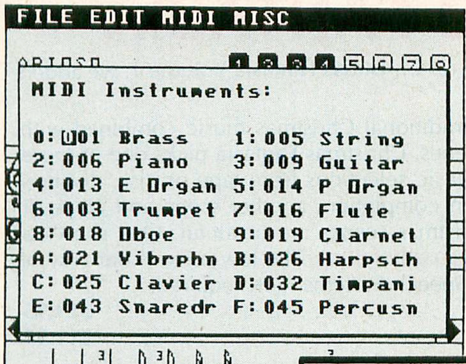

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FILE EDIT MIDI MISC

MIDI Instruments:

0:001 Brass     1:005 String
2:006 Piano     3:009 Guitar
4:013 E Organ   5:014 P Organ
6:003 Trumpet   7:016 Flute
8:018 Oboe      9:019 Clarnet
A:021 Vibrphn   B:026 Harpsch
C:025 Clavier   D:032 Timpani
E:043 Snaredr   F:045 Percusn
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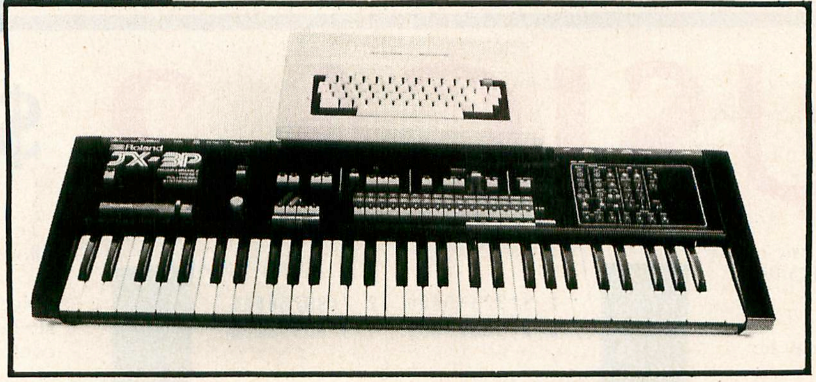
Introducing

CoCo 3 Compatible

COCO MIDI 2



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Now your COCO can talk to your MIDI music synthesizer. Whether you have a Korg, Roland, Casio, Yamaha, or Moog, it doesn't matter as long as it's MIDI equipped. Choose from our entry level MUSICA MIDI system that plays MUSICA files or our Professional COCO MIDI 2 system.

- Supports 16 Track recording and playback.
- Adjustable tempo.
- Over 45 Kbytes available (Over 15,500 MIDI events possible).
- Record to any track.
- Low Level track editing.
- LYRA editing. (one voice per track).
- Playback from any number of tracks.
- Quantizing to 1/16, 1/32, 1/64 intervals.
- Filter out MIDI data:
  - Key pressure
  - Program change
  - Pitch wheel
  - Control Change
  - Channel Pressure
  - System Message
- Graphic Piano Keyboard Display in both record and playback mode.
- Adjustable Key (Transposition).
- Save recording to disk for later playback or editing.
- Syncs to drum machine as MASTER or SLAVE.
- Sequencer features.
- 100% machine code.
- "Musician Friendly" Menu Driven.
- Metronome
- Many songs included.

Includes MIDI hardware interface, 2 MIDI cables, detailed manual, and software. Requires 64K CoCo, Y-Cable or Multi-Pak.

COCO MIDI 2 (disk only) #CM147 . **$149.95**
DOUBLE Y-CABLE #DY181 . . . . . . **$28.95**
TRIPLE Y-CABLE #TY173 . . . . **$34.95**

DX LIBRARIAN™

Save and load voice parameters for the Yamaha DX series of synthesizers (DX-7, DX-100, DX-21 etc.). Save sounds individually or as a group letting you load the entire synthesizer in seconds. Comes with professionally developed voices for the DX-7 worth 10 times the price. Requires COCO MIDI hardware interface.
DX LIBRARIAN (Disk only) #DX143 . . . . $39.95

CASIO LIBRARIAN

Save and load voice parameters for any Casio synthesizer (CZ-101, CZ-1000, CZ-5000 etc.) You can save from the: presets, cartridge, memory or buffer. Requires COCO MIDI hardware interface.
CASIO LIBRARIAN (Disk only) #CL169 . . . . **$39.95**

MUSICA MIDI™

MUSICA MIDI takes any MUSICA 2 music file and plays it through your MIDI synthesizer. We offer you over 800 tunes from our MUSIC LIBRARY series (sold separately) or create your own music using MUSICA 2. Inlcudes: documentation, plenty of music, and the cable to connect between the COCO and your synthesizer.
MUSICA MIDI Complete (Disk Only) #CM126 . . . . . . **$39.95**

MIDI KEYBOARD

If you own the Casio CZ-101 or similar MIDI synth, you know that the mini keys and the short 3 or 4 octave keyboard is limiting. MIDI KEYBOARD when used with our full size 5 octave keyboard gives you the flexibility you need. Comes with cable to connect the COCO to your MIDI synth.
MIDI KEYBOARD (Disk only) #MK167 . . . . **$29.95**

CHRISTMAS FANTASIA

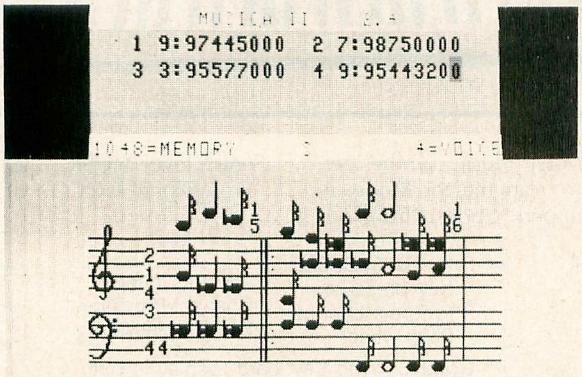
We got so many compliments last year for Christmas Fantasia Volume 1, we added a second all new version.

Christmas Fantasia is a collection of traditional Christmas music combined with beautiful high resolution Christmas scenes. Christmas Fantasia picks one of more than a dozen Christmas scenes and music selections from tape or disk, displays the picture and plays the music. Upon completion, another scene and piece of music is loaded and played. The Christmas scenes are beautiful. One shows a chapel nestled in a valley with **snow actually falling.** The low price is our way of saying "SEASONS GREETINGS" from Speech Systems. 64K required.

Volume 1 (Tape or Disk) #CF125	**$19.95**
Volume 2 (Tape or Disk) #CF126	**$19.95**

MUSICA 2

$29.95
Tape or Disk



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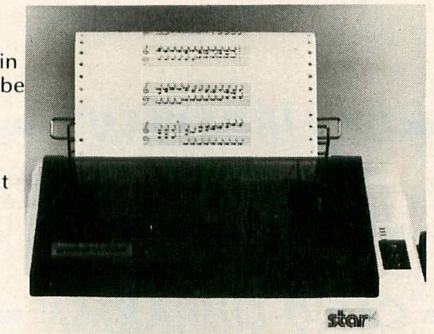
        MUSICA II     2.4
  1 9:97445000  2 7:98750000
  3 3:95577000  4 9:95443200

1048=MEMORY        3        4=VOICE
```

- When in stereo mode, music is played through our STEREO PAK (purchased separately).
- Loudness of each voice may be individually specified.
- Memory available is constantly displayed.
- Voice waveshapes may be exchanged between voices at any point.
- Tempo may be specified and may even be altered as the music plays.
- Flats and sharps supported.
- Billions of timbre combinations.
- High resolution graphic display, looks just like sheet music.
- MUSICA 2 is 100% software, no need for hardware unless you want music produced in STEREO. In that case, the STEREO PAK may be purchased separately. It's a must for the audiophile!
- Repeat bars allow repeating of music without re-inserting music a second or third time.
- 30 page manual describes all.
- Requires 64K.

CoCo 3 Compatible

- Output music to your printer (Gemini 10X, Epson, R.S. printers).



- Allows you to specify key signature.
- Voice timbre (waveshape) may be altered by specifying harmonic content just like stops on an organ.
- During editing, voice being inserted is displayed.
- Each measure is numbered for easy reading of music.
- Measure bars aid in reading and developing music.
- Each voice may be visually highlighted for easy identification.
- 4 Voices produced simultaneously.
- Input notes from Coco keyboard, joystick, or Piano Keyboard.
- Play music from your own BASIC program.
- Block copy music for easy music development.
- 100% machine language so it is lightning fast.
- Vibrato effect easily produced.
- With STEREO PAK, voices may be switched between left and right speakers as music plays.
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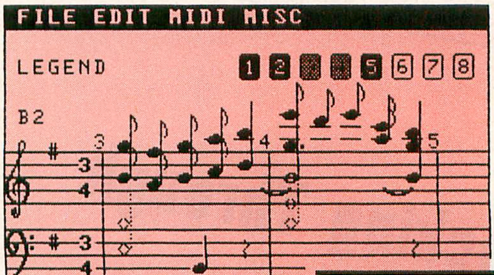

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Generate calendars for any year from 1583 on . . .

```
                JANUARY                                      FEBRUARY
SUN MON TUE WED THU FRI SAT                  SUN MON TUE WED THU FRI SAT
                 1   2   3                    1   2   3   4   5   6   7
 4   5   6   7   8   9  10                    8   9  10  11  12  13  14
11  12  13  14  15  16  17                   15  16  17  18  19  20  21
18  19  20  21  22  23  24                   22  23  24  25  26  27  28
25  26  27  28  29  30  31

                 MARCH
SUN MON TUE WED THU FRI SAT
 1   2   3   4   5   6   7
 8   9  10  11  12  13  14
15  16  17  18  19  20  21
22  23  24  25  26  27  28
29  30  31

                  MAY
SUN MON TUE WED THU FRI SAT
                     1   2
 3   4   5   6   7   8   9
10  11  12  13  14  15  16
17  18  19  20  21  22  23
24  25  26  27  28  29  30
31

                 JULY
SUN MON TUE WED THU FRI SAT
             1   2   3   4
 5   6   7   8   9  10  11
12  13  14  15  16  17  18
19  20  21  22  23  24  25
26  27  28  29  30  31

               SEPTEMBER
SUN MON TUE WED THU FRI SAT
         1   2   3   4   5
 6   7   8   9  10  11  12
13  14  15  16  17  18  19
20  21  22  23  24  25  26
27  28  29  30

               NOVEMBER
SUN MON TUE WED THU FRI SAT
 1   2   3   4   5   6   7
 8   9  10  11  12  13  14
15  16  17  18  19  20  21
22  23  24  25  26  27  28
29  30
```

Date Tracking Through the Ages

By Roger Bouchard

The Last Calendar (*TLC*) is likely to be the last calendar program you will ever need to type in. It can print any calendar year, from 1583 to whenever they revise the calendar again, on any 80-column printer.

It uses only one control code, for expanded print. Although this version is configured for Epson and compatible printers, it can very easily be adapted by changing lines 100 and 110 to whatever codes your printer uses. If your printer does not have expanded print capabilities, the program can be modified to work with even a teletype, if the lines in Listing 2 are typed in to replace those in Listing 1.

Another feature includes the ability to highlight a special date of your choice by replacing it with two asterisks (**).

The program is also self-prompting and fairly bulletproof, but if you have any questions you may call, write or contact me on the Delphi CoCo SIG (username:HARBIE).

(Questions about this program may be directed to the author at 5105 Cote St-Luc Rd. #12, Montreal, Quebec, Canada H3W 2H5, 514-486-2147. Please enclose an SASE when writing.) □

An electronic technician who specializes in the repair of minicomputers, Roger Bouchard bought his CoCo to learn about microprocessors and programming. Roger lives in Montreal and is devoted to his CoCo.

160 60
320 158
540 172
END 50

Listing 1: CALENDAR

```
10 REM LISTING1
20 REM THE LAST CALENDAR
30 CLEAR1000
40 DIMC(504),M(11)
50 L$=CHR$(10)
60 M1$="JANUARY  FEBRUARY  MARCH
    APRIL     MAY     JUNE     J
ULY    AUGUST   SEPTEMBEROCTOBER
  NOVEMBER DECEMBER"
70 S1$="  SUN MON TUE WED THU FR
I SAT   ":S1$=S1$+"           "+
S1$
80 M$="    %       %   ":M$=M$+"
      "+M$
90 M(0)=31:M(1)=28:M(2)=31:M(3)=
30:M(4)=31:M(5)=30:M(6)=31:M(7)=
31:M(8)=30:M(9)=31:M(10)=30:M(11
)=31
100 S$=CHR$(14)
110 E$=CHR$(20)
120 CLS:LINEINPUT"YEAR TO BE PRI
NTED : ";Y$
130 Y=ABS(INT(VAL(Y$))):IFY<>VAL
(Y$)THENGOSUB650:GOTO120
140 IFY>1582THENIFY=INT(Y/4)*4TH
ENM(1)=29:IFY=INT(Y/100)*100ANDY
<>INT(Y/400)*400THENM(1)=28ELSEE
LSEELSEGOSUB650:GOTO120
150 CLS:LINEINPUT"MESSAGE TO BE
PRINTED  :        ";MG$
160 IFLEN(MG$)>40THENGOSUB660:GO
TO150
170 CLS:LINEINPUT"BIRTH MONTH TO
 HIGHLIGHT        (1 - 12 0 IF N
ONE )";BM$:BM=ABS(INT(VAL(BM$)))
:IFBM<>VAL(BM$)ORBM>12ORBM$<"0"O
RBM$>"13"THENGOSUB670:GOTO170
180 IFBM THENELSEBD=0:BM=0:GOTO2
00
190 CLS:LINEINPUT"BIRTH DAY TO H
IGHLIGHT          (1 - 3 , 0 IF
NONE )";BD$:BD=ABS(INT(VAL(BD$))
):IFBD>M(BM-1)ORBD<>VAL(BD$)ORBM
$<"0"ORBM$>"13"THENGOSUB680:GOTO
```

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```
190
200 IFBD THENBD=BD+BM*42
210 CLS:PRINT@224,"SETTING UP CA
LENDAR YEAR "Y$
220 REM CALENDAR SET-UP
230 J=Y*365:GOSUB620
240 FORML=0TO11:DM=1
250 FORWL=0TO5
260 FORDL=DW TO6
270 C(ML*42+WL*7+DL)=DM:DM=DM+1
280 IFDM>M(ML)THEN300ELSENEXTDL
290 DW=0:NEXTWL
300 DW=DL+1:IFDW=7THENDW=0
310 NEXTML
320 IFBD GOSUB 560
330 CLS:PRINT@224,"PRINTING CALE
NDAR YEAR "Y$
340 REM CALENDAR PRINTOUT
350 PRINT#-2," "
360 Y$=MID$(STR$(Y),2):PRINT#-2,
L$N$S$STRING$(18-LEN(Y$)/2," ")Y
$L$L$E$C$
370 FORML=0TO10STEP2
380 PRINT#-2,L$S$;
390 PRINT#-2,USINGM$;MID$(M1$,ML
*9+1,9);MID$(M1$,ML*9+10,9)
400 PRINT#-2,E$S1$
410 FORWL=0TO5:W$=" "
420 FORMR=0TO1
430 FORDL=0TO6
440 D=(ML+MR)*42+WL*7+DL:D$=RIGH
T$("     "+STR$(C(D)),4):IFVAL(D
$)=0THEND$="    "
450 IFC(D)=99THEND$="  **"
460 W$=W$+D$:NEXT
470 IFMR<1THENW$=W$+"
    "
480 NEXT
490 PRINT#-2,W$:NEXT
500 NEXT
510 PRINT#-2,L$L$N$S$STRING$(18-
LEN(MG$)/2," ")MG$E$L$L$
520 PRINT#-2,L$
530 CLS
540 END
550 REM SET ** ON BIRTHDATE
560 J=0:IFBM=1THEN580
570 FORML=0TOBM-2:J=J+M(L):NEXT
580 J=J+Y*365:GOSUB620
590 C(BD+DW-43)=99
600 RETURN
610 REMDAY OF WEEK CALCUL
620 IFY<>INT(Y/400)*400ANDY=INT(
Y/100)*100THENJ=J+1
630 V=J+INT(Y/400)-INT(Y/100)-36
5+INT((Y-1)/4):V1=1+V-INT(V/7)*7
:DW=V1-INT(V1/7)*7
640 RETURN
650 CLS:PRINT"THE YEAR MUST BE F
ROM 1583 UP":GOTO690
660 CLS:PRINT"THIS PROGRAM CAN O
NLY PRINT A   ONE LINE MESSAGE W
HICH MUST BE  LESS THEN 40 CHARA
CTERS LONG .":GOTO690
670 CLS:PRINT"NO SUCH MONTH IN A
 NORMAL YEAR":GOTO690
680 CLS:PRINT"THIS DATE DOES NOT
 EXIST IN THE MONTH AND YEAR SPE
CIFIED ."
690 PRINT@448,"SORRY CHARLY !",,
"PRESS ANY KEY TO TRY AGAIN";
700 IFINKEY$=""THEN700ELSERETURN
```

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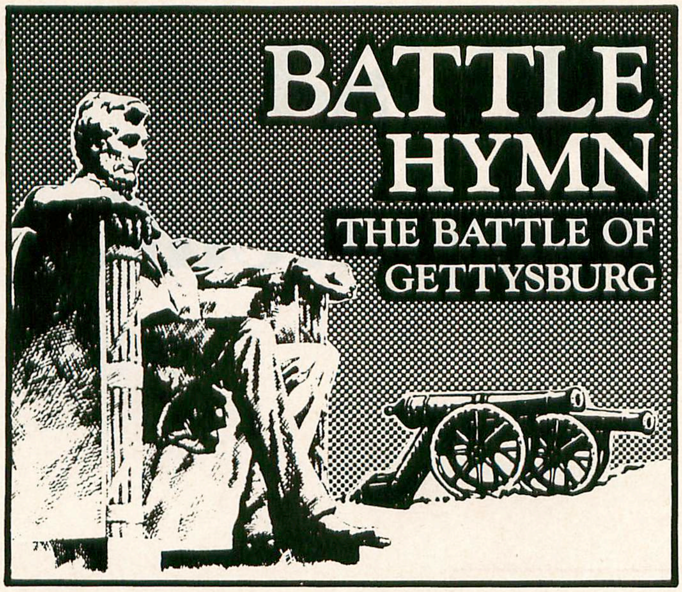
Listing 2: CALMOD

```
10 REM LISTING 2
25 REM NO EXPANDED PRINT
80 M$="            %       %   "
:M$=M$+"                   "+M$
100 S$=CHR$(0)
110 E$=CHR$(0)
360 Y$=MID$(STR$(Y),2):PRINT#-2,
L$N$S$STRING$(36-LEN(Y$)/2," ")Y
$L$L$E$C$
510 PRINT#-2,L$L$N$S$STRING$(36-
LEN(MG$)/2," ")MG$E$L$L$
```



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Player controls Lee's army of 11 divisions (39 individual) brigades including 3 cavalry (Stuart) and 3 artillery (Alexander) and must capture 5 victory objectives to win decisively. It's all here, from Culp's Hill to Little Round Top, from Pickett's charge to Hood's heroic victory at Devil's Den.

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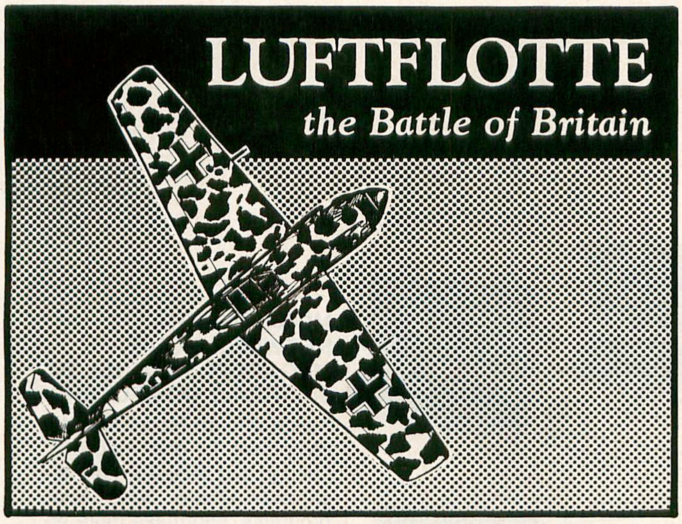
Brigades must be turned to march or fire. Union troops must reload after firing.

Player may limber or unlimber cannon; must watch his fatigue factors and prevent troops from routing. The object is to force the flank and pin the enemy in a cross fire. Easier said then done. Very historic, with an Ark Royal touch.

Hi res graphics; machine language. Game save. Play takes 3-5 hours. **$29.00**



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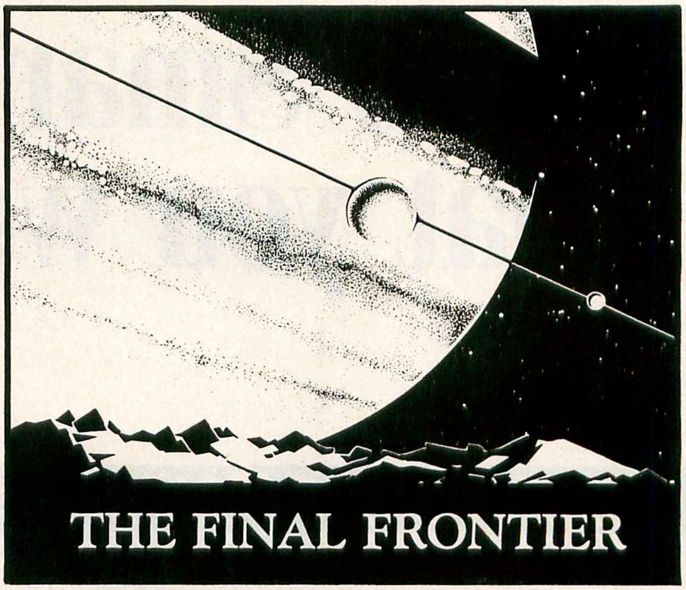

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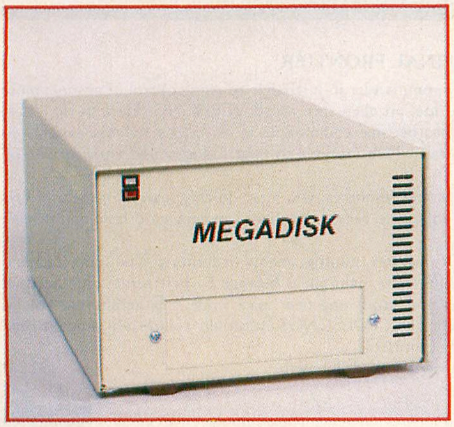

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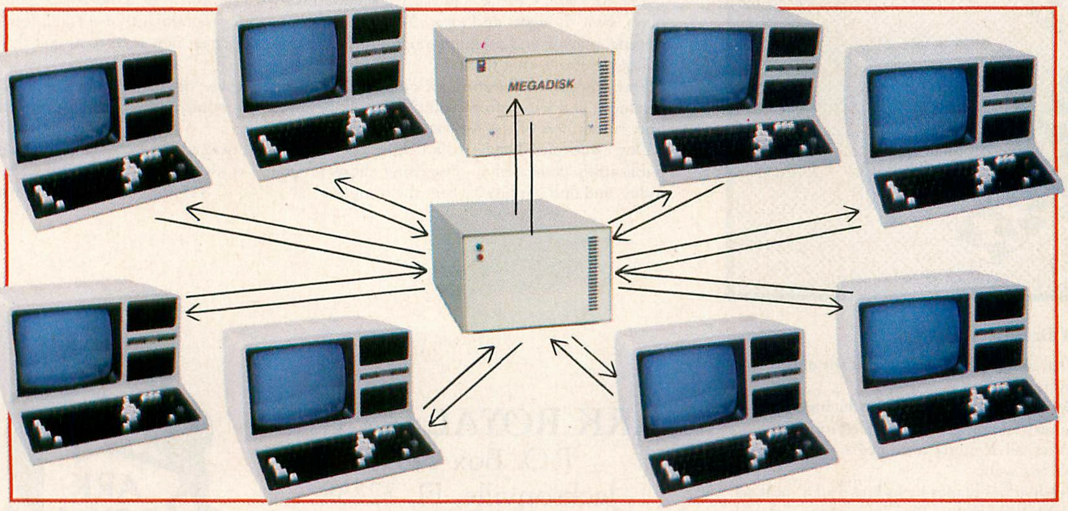

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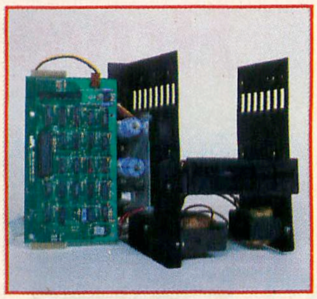

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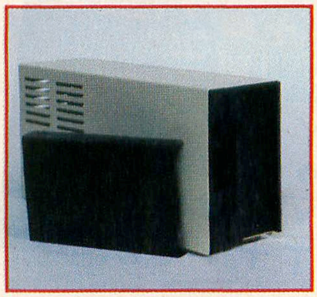

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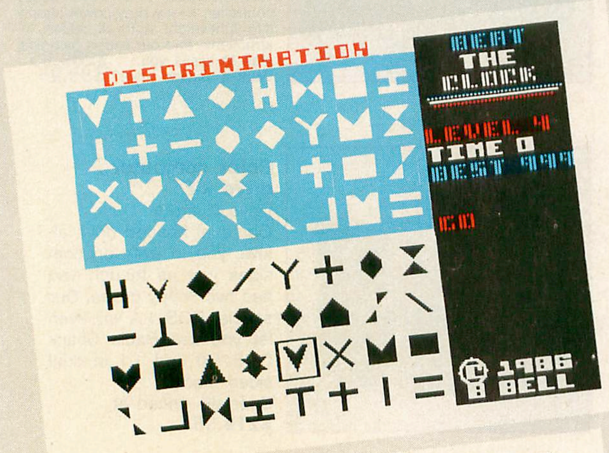
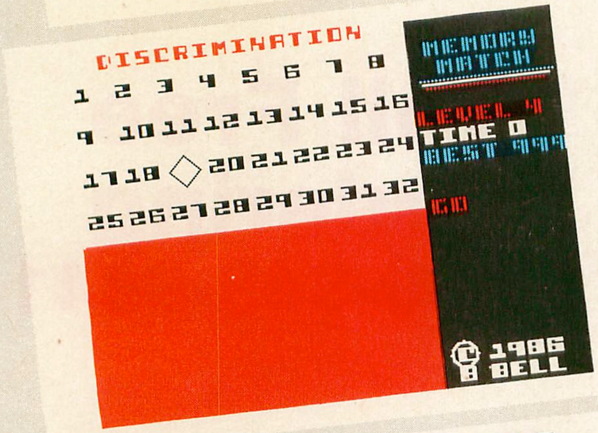
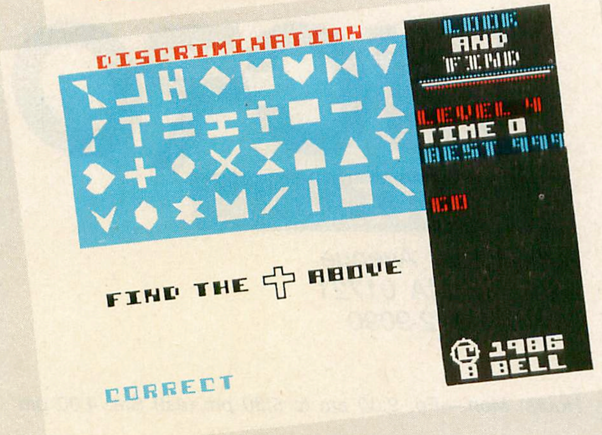
Three entertaining games to challenge visual memory

The Eyes Have It

By Bruce K. Bell, O.D.







FIND THE ✚ ABOVE

CORRECT

Discrimination actually consists of three games that can be used in three different ways. They were written for use in my office with patients undergoing vision therapy, but as you'll see, are genuinely entertaining as well.

Beat the Clock is similar to Perfection, a popular game in which various-shaped playing pieces must be placed in a puzzle within a certain time period. In this version, a shaded area with white "holes" appears in the upper half of the screen representing the puzzle board, and the lower screen contains the black playing pieces. Move the blinking box to the piece you desire to "pick up." Press the firebutton and the cursor moves to the upper half of the screen. Move the blinking box to the hole matching the piece you "picked up" and press the firebutton to "drop" it in the hole. The piece does not disappear from the lower screen until the piece is correctly placed in the puzzle board in the upper screen. Continue this process until all the pieces are used.

The object of the second game, Memory Match, is to remember the location of shapes that are "hidden" under different numbers. Move the blinking box over a number and press the firebutton to reveal the shape "underneath" it. Then move to another number and press again to reveal a second shape. If they are the same, you have a match. Continue until all shapes are revealed.

Look and Find is played by moving the blinking box over the shape in the upper screen that is the same as the shape in the lower screen. Continue until all shapes are identified.

In all three games the right joystick moves the blinking box. Your score represents the approximate number of seconds it took for you to complete the game. Of course, the lower the score, the better you have done. Four levels are available, with Level 4 being the most difficult. The "Best Score" is reset each time a new level is selected.

There are three ways *Discrimination* may be used. First of all, it may be played just as a game of challenge with your only goal being to enjoy yourself.

Secondly, it may be used to improve visual skills by training in a controlled environment. *Discrimination* may be used to help improve

---

Bruce Bell practices optometry in his home town of Rockmart, Georgia. He spends hours using programs he finds in THE RAINBOW *and programming his CoCo for use in his office and at home. Bruce's program,* CoCo Zone *is the grand prize winner in the Third Rainbow Adventure contest.*

eye-hand coordination, rapid eye movements, dynamic peripheral awareness (side vision), visual memory and visual strategies. This may be especially helpful for athletes in high speed sports, such as tennis and basketball.

Finally, it can be used to help preschoolers and early elementary students learn size and shape discrimination, as well as laterality skills (knowing right from left) and visual memory.

What is the difference in the three ways of using *Discrimination*? None, really, except for who is using *Discrimination* and why they are playing it. Please note that none of this is intended to be medical advice; if you suspect you have any eye or visual problem, you should consult your eye care professional. I just wanted to point out the many ways *Discrimination* can be enjoyed, by young and old alike.

(Questions about this program may be directed to Dr. Bell at 614 East Elm St., Rockmart, GA 30153; 404-684-5650. Please enclose an SASE when writing.) ☐

105	147	2110	215
165	193	2165	54
540	161	2215	140
585	61	2245	33
1055	216	END	197
2035	11		

The listing: DISCRIM

```
0 'DISCRIMINATION 1.0; COPYRIGHT
 (C) 1986 BRUCE BELL
1 'note: pressing 'Q' anytime du
ring play, will end the game bef
ore all pieces are moved.
10 CLEAR1000:DIMF$(31),L$(25),F(
31),P(31),U(31),A(11):HS=999
15 GOSUB2205
20 POKE65494,0:CLS:PRINT"DISCRIM
INATION 1.0","COPYRIGHT (C) 1986
 BRUCE BELL  EXTENDED COLOR BAS
IC 32K":PRINT:PRINT
25 PRINT@160,STRING$(13,60)" MEN
U "STRING$(13,62),,TAB(6)"1. BEA
T THE CLOCK"TAB(38)"2. MEMORY MA
TCH"TAB(38)"3. LOOK & FIND"TAB(3
8)"4. END PROGRAM":PRINT:PRINT"
ENTER YOUR SELECTION (1-4)";:S=0
30 FORP=1024TO1535:IFS<1ORS>4THE
NS=VAL(INKEY$):POKEP,(PEEK(P)+64
)AND127:NEXT:GOTO30
35 IFS=4THENCLS:PRINT"BYE BYE":E
NDELSEPRINTS:PRINT@418,"LEVEL OF
 DIFFICULTY (1-4)";:INPUTLD$:LD=
VAL(LD$):IFLD>4THEN30ELSEIFLD<1T
HEN20
40 POKE65495,0:ONS GOTO105,505,1
005
100 '*****beat the clock ******
105 CLS8:PRINT@96,"AS QUICKLY AS
 POSSIBLE, PLACE   THE BLACK FIG
URES ON THE LOWER  SCREEN IN THE
 MATCHING HOLES","ABOVE. USE THE
 JOYSTICK TO MOVE THE CURSOR AND
 PRESS THE FIRE   BUTTON TO PICK
 UP OR PLACE A","FIGURE.",,,,"PL
AY BEGINS IN ONE MOMENT..."
110 PMODE4,1:PCLS:DRAW"BM180,0C5
D191"
115 FORK=0TO31:U(K)=0:P(K)=0:F(K
)=0:NEXT
120 GOSUB2025:'draw lower screen
125 GOSUB2050:'draw upper screen
130 W$="BEAT":DRAW"BM200,8C6":GO
SUB2185:W$="THE":DRAW"BM205,18C8
":GOSUB2185:W$="CLOCK":DRAW"BM19
5,28C7":GOSUB2185:'title
135 GOSUB2160:'draw copr notice
140 GOSUB2085:'countdown
145 X=5:Y=104:K=1:C=3:N=0:TIMER=
0:'initialize game
150 GOSUB2105:'joystick input
155 IFQ$="Q"THEN2135ELSEIFK=2THE
N165:'fb pressed or quit?
160 K=2:C=1:D=94:XG=X:YG=Y:PG=P:
Y=Y-94:SOUND100,1:GOTO175:'adjus
t for upper board
165 IFF(PG)=P(P)THENGET(XG,YG)-(
XG+20,YG+20),A,G:COLOR0,0:LINE(X
G,YG)-(XG+20,YG+20),PSET,BF:PUT(
X,Y)-(X+20,Y+20),A,AND:F(PG)=-1:
N=N+1:SOUND200,1ELSESOUND50,1:'m
atch?
170 K=1:C=3:D=0:Y=Y+94:'adjust f
or lower board
175 IFN=LD*8THEN2135ELSEGOSUB212
0:GOTO155:'figures completed?
500 '*****memory match *******
505 CLS6:PRINT@96,"A FIGURE HIDE
S BEHIND EACH NUM- BER. PRESSING
 THE FIRE BUTTON   UNCOVERS THE
FIGURE. AS QUICKLY AS POSSIBLE U
SE THE JOYSTICK TO MATCH THE FIG
URES","PLAY BEGINS IN ONE MOMENT
..."
510 FORK=0TO31:U(K)=0:P(K)=0:F(K
)=0:NEXT:PG=-1
515 FORK=0TOLD*4-1
520 F=RND(32)-1:IFF(F)=1THEN520E
LSEF(F)=1:FORX=1TO2
525 P=RND(LD*8)-1:IFU(P)=1THEN52
5ELSEP(P)=F:U(P)=1:NEXTX,K
530 PMODE4,1:PCLS5:COLOR0,5:LINE
(180,0)-(255,191),PSET,BF:POKE17
8,2:LINE(0,98)-(180,191),PSET,BF
:SCREEN1,1
```

```
535 GOSUB2070:'print discriminat
ion
540 N=1:FORY=22TO88STEP22:FORJ=0
TO2*LD-1:X=1+88/LD*J:DRAW"BM=X;,
=Y;C5":W$=STR$(N):GOSUB2185:N=N+
1:NEXTJ,Y:'print numbers in squa
res
545 W$="MEMORY":DRAW"BM188,18C6"
:GOSUB2185:W$="MATCH":DRAW"BM194
,28":GOSUB2185
550 GOSUB2160:'draw copr notice
555 GOSUB2085:'countdown
560 X=5:Y=10:C=3:K=1:N=0:D=94:TI
MER=0:'initialze game
565 GOSUB2105:'joystick input
570 IFQ$="Q"THEN2135ELSEIFP=PG O
RP(P)=-1THENSOUND1,1:GOTO565ELSE
IFK=2THEN580
575 K=2:XG=X:YG=Y:PG=P:GOSUB2010
:SOUND100,1:GOTO590
580 K=1:GOSUB2010:IFP(P)=P(PG)TH
ENN=N+1:W$="MATCHES"+STR$(N):COL
OR0,5:LINE(30,120)-(150,135),PSE
T,BF:DRAW"BM40,130C5":GOSUB2185:
FORT=1TO3:PLAY"L100;1;2;3;4;5;6;
7;8;9;10;11;12":NEXT:P(P)=-1:P(P
G)=-1:GOTO590:'match!
585 SOUND10,2:COLOR0,5:LINE(XG,Y
G)-(XG+20,YG+20),PSET,BF:LINE(X,
Y)-(X+20,Y+20),PSET,BF:W$=STR$(P
G+1):H=XG-5:V=YG+12:DRAW"BM=H;,=
V;C5":GOSUB2185:W$=STR$(P+1):H=X
-5:V=Y+12:DRAW"BM=H;,=V;":GOSUB2
185:PG=-1:'no match
590 IFN=LD*4THEN2135ELSE565
1000 '*****look and find ******
1005 CLS4:PRINT@128,"USE THE JOY
STICK TO FIND THE","FIGURE SHOWN
 IN THE BOTTOM HALF OF THE SCREE
N. PRESS THE FIRE   BUTTON WHEN
YOU'VE FOUND IT.","PLAY BEGINS I
N ONE MOMENT..."
1010 FORK=0TO31:U(K)=0:P(K)=-1:N
EXT
1015 PMODE4,1:COLOR0,5:PCLS:LINE
(180,0)-(255,191),PSET,BF:DRAW"B
M0,100R180"
1020 GOSUB2050:'draw upper scree
n
1025 W$="LOOK":DRAW"BM200,8C6":G
OSUB2185:W$="AND":DRAW"BM205,18C
8":GOSUB2185:W$="FIND":DRAW"BM20
0,28C7":GOSUB2185:'title
1030 GOSUB2160:'draw copr notice
1035 W$="FIND THE     ABOVE":DRA
W"BM10,130C5":GOSUB2185
1040 GOSUB2085:'countdown
1045 X=5:Y=10:D=94:C=1:N=0:TIMER
=0:'initialize game
1050 F=RND(LD*8)-1:IFU(F)=1THEN1
050ELSEPMODE4,1:SCREEN1,1:COLOR5
,0:LINE(90,118)-(110,138),PSET,B
F:DRAW"BM100,128C0XF$(F);":SOUND
200,1:PMODE3,1
1055 GOSUB2105:'joystick input
1060 IFQ$="Q"THEN2135ELSECOLOR0,
5:LINE(5,170)-(105,180),PSET,BF:
IFF<>P(P)THENW$="LOOK AGAIN":DRA
W"BM5,180C7":GOSUB2185:SOUND5,2:
GOTO1055:'did not find
1065 W$="CORRECT":DRAW"BM5,180C6
":GOSUB2185:N=N+1:U(F)=1:FORT=1T
O3:PLAY"L100;1;2;3;4;5;6;7;8;9":
NEXT:'found it!
1070 IFN=LD*8THEN2135ELSE1050
1075 GOTO1075
2000 '!!!!!!!subroutines!!!!!!!
2005 'draw figure in memory matc
h
2010 PMODE4,1:SCREEN1,1:COLOR5,0
:LINE(X,Y)-(X+20,Y+20),PSET,BF:H
=X+10:V=Y+10:DRAW"BM=H;,=V;C0XF$
(P(P));":PMODE3,1
2015 RETURN
2020 'draw lower screen subr
2025 K=0:FORY=114TO180STEP22:FOR
J=0TO2*LD-1
```

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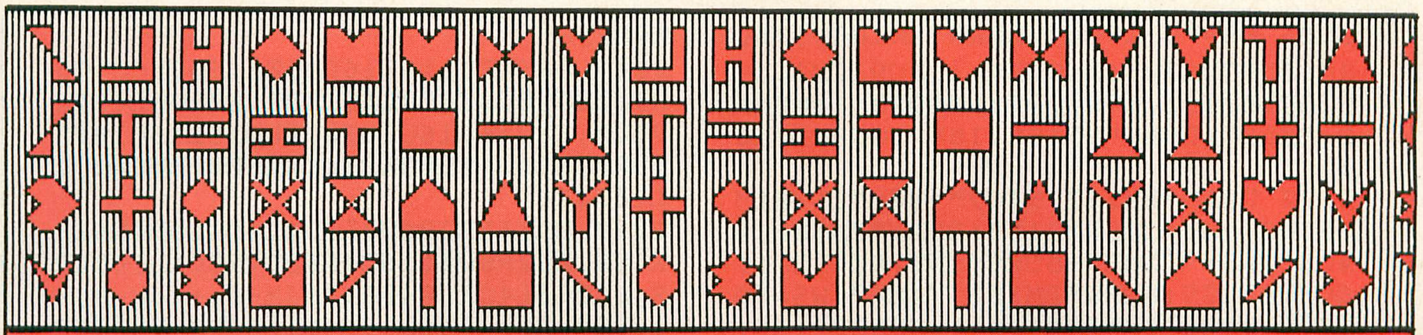

```
2030 P=RND(LD*8)-1:IFU(P)=1THEN2
030ELSEF(K)=P:U(P)=1:K=K+1:X=14+
88/LD*J:DRAW"BM=X;,=Y;C5XF$(P);"
:NEXTJ,Y
2035 COLOR5,0:LINE(0,8)-(180,100
),PSET,BF:PAINT(1,191),5,5
2040 RETURN
2045 'draw upper screen subr
2050 K=0:FORY=20TO86STEP22:FORJ=
0TO2*LD-1
2055 P=RND(LD*8)-1:IFU(P)=2THEN2
055ELSEP(K)=P:U(P)=2:K=K+1:X=14+
88/LD*J:DRAW"BM=X;,=Y;C0XF$(P);"
:NEXTJ,Y
2060 DRAW"BM0,100R180":POKE178,1
:PAINT(1,9),,0
2065 COLOR5,5:LINE(0,0)-(180,7),
PSET,BF
2070 SCREEN1,1:PMODE3,1:W$="DISC
RIMINATION":DRAW"BM20,6C7":GOSUB
2185
2075 RETURN
2080 'countdown subr
2085 W$="GET":DRAW"BM184,100C6":
GOSUB2185:W$="READY":DRAW"BM184,
110":GOSUB2185:SOUND50,1:FORJ=1T
O700:NEXT:COLOR5,5:LINE(184,102)
-(255,110),PSET,BF:W$="SET":DRAW
"BM184,110C6":GOSUB2185:SOUND100
,1:FORJ=1TO700:NEXT
2090 COLOR5,5:LINE(184,90)-(255,
110),PSET,BF:W$="GO":DRAW"BM184,
100C7":GOSUB2185:SOUND150,2
2095 RETURN
2100 'joystick subr
2105 IFTIMER>54000THENQ$="Q"ELSE
Q$=INKEY$
2110 IFQ$="Q"THENRETURNELSEJH=JO
YSTK(0):JV=JOYSTK(1):POKE178,C:D
RAW"BM=X;,=Y;R20D20L20U20"
2115 X=INT(JH*LD/32)*88/LD+5:Y=I
NT(JV/16)*22+104-D:P=(X-5+(Y+D-1
04)*8)/(88/LD):P=INT(P+.5)
2120 PK=PEEK(65280):IFPK<>126AND
PK<>254THENZ=1ELSEIFZ THENZ=0:RE
TURN
2125 DRAW"BM=X;,=Y;C5R20D20L20U2
0":GOTO2105
2130 'compute score/replay subr
2135 SC=TIMER/60:COLOR5,5:IFQ$<>
"Q"THENIFSC<HS THENHS=SC
2140 COLOR5,5:LINE(182,44)-(255,
74),PSET,BF:GOSUB2170
2145 COLOR5,5:LINE(184,90)-(255,
110),PSET,BF:DRAW"BM184,100C7XL$
(15);C6":W$="LAY":GOSUB2185:DRAW
"BM205,110C8":W$="OR":GOSUB2185:
DRAW"BM210,120C7XL$(16);C6":W$="
UIT":GOSUB2185
2150 Q$=INKEY$:IFQ$="P"THENSCREE
N0,0:GOTO40 ELSEIFQ$="Q"THEN10EL
SE2150
2155 'draw score/copr subr
2160 DRAW"BM252,32C6L68BF2C8R64B
G2C7L60"
```

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```
2165 W$="C 1986":DRAW"BM188,178C
8":GOSUB2185:PMODE4,1:SCREEN1,1:
CIRCLE(191,175),07:PMODE3,1:W$="
B BELL":DRAW"BM188,188":GOSUB218
5
2170 DRAW"BM182,54C7":W$="LEVEL"
+STR$(LD):GOSUB2185:DRAW"BM182,6
4C8":W$="TIME"+STR$(INT(SC+.5)):
GOSUB2185:DRAW"BM182,74C6":W$="B
EST"+STR$(INT(HS+.5)):GOSUB2185:
RETURN
2175 RETURN
2180 'print hi-res character
2185 FORK=1TOLEN(W$):L=ASC(MID$(
W$,K,1)):IFL>64ANDL<91THENL$=L$(
L-65)ELSEIFL=46THENL$="URDLBR6"E
LSEIFL<48ORL>57THENL$="BR6"ELSEL
$=N$(L-48)
2190 DRAWL$:NEXTK
2195 RETURN
2200 'define figures
2205 FORK=0TO31:READF$(K):NEXT:D
ATABD8E4R4H4E4L4H4G4L4F4G4R4F4,"
BD8R8M-8,-16M-8,+16R8",BD8R8U16L
16D16R8,BD6R8U12L16D12R16,BH2U6R
4D6R6D4L6D6L4U6L6U4R6
2210 DATABU2E6F2G6F6G2H6G6H2E6H6
E2F6,BL8E8F8G8H8,BU2E6F2G6D8L4U8
H6E2F6
2215 DATAE8L16F16L16E8,BU8F6D2G6
H6U2E6,BU8F8D8L16U8E8,BR2U8L4D16
R4U8,F8U16G16U16F8,E8D16L16U16F8
,BR2D8L4U12L6U4R16D4L6D8,BU2R8D4
L16U4R8
2220 DATABR2R6U4L6U4L4D4L6D4R6D8
R4U8,BU2R8U4L16D4R8BD4R8D4L16U4R
8,BR2E6L4G12R4E6,"E8M-8,+16M-8,-
16F8",BD8R8H6U10L4D10G6R8,BE2U6R
4D16L4U6L4D6L4U16R4D6R4,BD8R8U4L
6U4R6U4L16D4R6D4L6D4R8,BD8R8U16L
4D12L12D4R8,BD8R8U16L4G4H4L4D16R
8
2225 DATABR8H8L4G4F4G4F4R4E8,BD8
E6U4H6G6D4F6,U8R8G16R8U8,BL2H6R4
F12L4H6,BD8E8U8L4G4H4L4D8F8,"BD8
M+8,-16L4G4H4L4M+8,+16",U8L8F16L
8U8
2230 'define hi-res char set
2235 N$(0)="NU6R4U6L4R6D6BR4":N$
(1)="R6UL2NL4U5L2DR2BR6BD5":N$(2
)="R6UNL2BU2U3L6R4D3L4D3BR10":N$
(3)="R6U3NL4U3L6R4D6BR6":N$(4)="
BU3NU3R4ND3U3R2D6BR4"
2240 N$(5)="UR2DL2R6U3L6U3R2ND3R
4BR4BD6":N$(6)="NU6R6U3LND3L5U3R
6DL2BR6BD5":N$(7)="BU6R4D6RU6RD6
BR4":N$(8)="U3NR4U3R4D6RU6RD6L6B
R10":N$(9)="BU3NR4U3R4D6RU6RD6BR
4"
2245 L$(0)="U6R2ND6R4D3NL6D3BR4"
:L$(1)=L$(0)+"BL4L6BR10":L$(2)="
NR6U6R2ND6R4D2BF4":L$(3)="U6R2ND
6R2F2D2G2BR6":L$(4)="NR6U3NR4U3R
2ND6R4BD6BR4":L$(5)="U3NR4U3R2ND
6R4BD6BR4":L$(6)="NR6U6R2ND6R4BD
4D2BR4"
2250 L$(7)="U6R2D3ND3R4U3D6BR4":
L$(8)="R2U6L2R6L2D6R2BR4":L$(9)=
"R2U6L2R6L2D6BR6":L$(10)="U6R2D2
NM+4,-2ND4F4BR4":L$(11)="U6R2D6R
4BR4":L$(12)="U6R2ND6F2E2D6BR4"
2255 L$(13)="U6R2D3R2D3R2NU6BR4"
:L$(14)="U6R6L4D6R4NU6BR4":L$(15
)="U6R2ND6R4D3L4BD3BR8":L$(16)="
U6R2ND6R4D6L6R4BU2M+4,+2BR4":L$(
17)="U6R2ND6R4D3L4R2M+2,+3BR4":L
$(18)="R6U3L2ND3L4U3R2ND3R4BD6BR
4"
2260 L$(19)="BU6R2ND6R2ND6R2BD6B
R4":L$(20)="U6R2D6R4NU6BR4":L$(2
1)="BR2H2U4R2D4F2E2U4BD6BR4":L$(
22)="BU2U4R2D6E2F2NU6BR4":L$(23)
="UE2H2UR2DF2G2DBR4UH2E2UBD6BR4"
:L$(24)="UR2DL2R6U3NU3L6U3R2D3BR
8BD3":L$(25)="R6UL2DL4U2M+6,-2U2
L6DR2
2265 RETURN
```

Submitting Material To Rainbow

Contributions to THE RAINBOW are welcome from everyone. We like to run a variety of programs that are useful/helpful/fun for other CoCo owners.

Program submissions must be on tape or disk and it is best to make several saves, at least one of them in ASCII format. We're sorry, but we do not have time to key in programs. All programs should be supported by some editorial commentary explaining how the program works. Generally, we're much more interested in how your submission works and runs than how you developed it. Programs should be learning experiences.

We do pay for submissions, based on a number of criteria. Those wishing remuneration should *so state* when making submissions.

For the benefit of those who wish more detailed information on making submissions, please send a self-addressed, stamped envelope (SASE) to: Submissions Editor, THE RAINBOW, The Falsoft Building, P.O. Box 385, Prospect, KY 40059. We will send you some more comprehensive guidelines.

Please do not submit programs or articles currently submitted to another publication.

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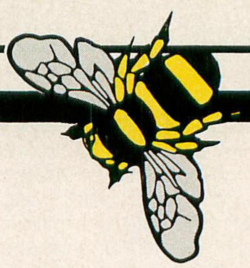


Minimize bug problems and increase your programming expertise

ESCAPE FROM THE BUG ZONE

BY EUGENE VASCONI

Picture, if you will, a dimly lit workshop. The only perceptible activity centers around quickly moving fingers performing a computeresque symphony on the keyboard. Atop the paper-clogged table rests a smoking beaker of cocoa (what else?); in the distance, thunder rumbles. Line after line is entered from voluminous pages of THE RAINBOW, still warm after the journey from Prospect, Ky.

Meet Mr. I.N. Putter, an unsuspecting participant in this pseudo-Frankenstein scenario, who is unaware of his imminent, never-to-be-forgotten voyage into "The Bug Zone." (Music, please.)

Those of us having an affinity for the Color Computer have the chance to conquer The Bug Zone. Since we create most of them ourselves, we can quite easily eradicate our bug problems provided we are armed with the right ammunition: knowledge. Debugging is in itself an art, just like creating original programs. As such, it can be quite rewarding and a valuable aid toward better understanding programming.

This is written for less experienced computer users who are still refining their basic skills. It offers certain techniques about debugging and should make the prospect of entering listings and handling the debugging process less frightening.

What can be done to help Mr. Putter avoid an unnecessary journey into The Bug Zone? The most obvious ammunition is some understanding of how BASIC vernacular is applied to make the computer perform a particular task. For that, he must become familiar with the language: Where do O's go in a `PLAY` statement? How big a number can be used in a circle coordinate? When can remarks be eliminated? Attempting to enter a listing without at least an elementary understanding of the parameters is like playing a trumpet and not knowing what the valves are for.

Assuming we have done our homework, most bugs can be squashed during the actual typing phase. Listings such as those in the RAINBOW are very helpful, since they reflect what should appear on the computer screen (the 32-character width). As you enter the listing, pay particular attention that what you've typed matches the ends of the magazine lines. Make your information match the RAINBOW's exactly. Any variation could mean you've made an error. Take a moment after every line to check this. Use a marker to help avoid jumping to another line. Try a pen clipped to the side which points to the proper spot; as you continue, move it down the page. This technique can prevent line jumping or typing in the same information twice. As we all know, wading through tightly packed lines for hours can be hazardous to your eyesight; this will help.

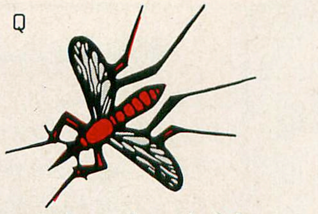
Pay attention to addresses. A "28" typed in place of a "280" will eventually cause the program to act strangely or give a UL Error when the CoCo tries to locate an address that doesn't exist.

Even if there is no machine language in the program, always save it to tape before you run it. You may have typed in an accidental poke that will lock the unit, and your typing efforts will have been wasted when the power must be turned off to free the machine. An even wiser practice is to make in-progress saves while entering, so if the power goes off you won't have lost everything. I learned this lesson when hours of typing during a storm ended in a one-second power failure. My CoCo, trained as it was, got scared and forgot everything I had been teaching it. I now save, even when taking a short break. Keep a spare work tape around for this purpose.

If the program doesn't run properly go about your debugging and, especially if machine language is used, mark your corrections in the magazine, power down, reload and then edit. Again, save before trying. In this way, you'll be certain everything is correct from scratch and not helped by a past input from you or the program, which may be masking a problem.

Trips into The Bug Zone are most frequently scheduled by Syntax Errors. They are the most common and usually the easiest to find except for the ones pointed out by the computer that you check 30 times to no avail. Don't worry, they're there. They hide in things like those formulas the geniuses create with 200 parentheses and 50 multiplications. Remember, you need just as many ('s as you need)'s for it all to work. You don't need to understand the formula to be sure it is entered correctly, just count. Pay particular attention to semicolons, colons, periods and commas; they can look alike. This is an area many programmers need to watch, and I have been a violator as well. Let's start avoiding similar-looking letter/number combinations where possible, like `O(0)=I(1)` or `S$(8)=MN$(I)`. Of course, certain information must be programmed according to basic requirements such as `PLAY "L8B05"`, but notice how many of the following look similar to type-weary eyes especially on a television plagued with RF interference:

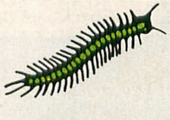
```
O - 0 - Q
I - 1
B - 8
S - $
N - M
G - 6
* - +
```



This is one area where thoughtful programming can assist the variety of debugging talents found in the CoCo

---

Eugene Vasconi is a helicopter pilot in San Antonio, Texas, as well as a musician and free-lance television producer. His major interests on the CoCo are graphics and music.



community and make entering listings much easier.

TM Errors are solved simply by finding the place where a `$` or string designation was either omitted or added by mistake. `$` can only designate string material like `A$="DOG"` not `A$=76`. There are a few modifications to this rule, but basically when acquiring the TM Error, look for a dropped `$`.

The two errors that strike most fear into human hearts are the OD Error and the FC Error. The first because it tells us we must wade through those 800 data lines we barely got through in the first place, and the second because it can be caused by something far away from the line listed as the error line.

The OD or (Out of Data) Error is not a particularly overwhelming problem. First, by yelling "out of data" the computer is saying that it wanted to read more than you gave it. That tells us we have one problem: The read amount doesn't match the amount of data available. It isn't necessary to understand the program to find the fix, simply check the read amount. If it says `10 FOR X=1 TO 99:READ A$(X):NEXT X`, we know we need 99 pieces of data to satisfy the computer. Be certain the 99 is correct. Now go to all those data lines and simply count the numbers between the commas; they should total 99. If not, you missed one somewhere, so double-check the magazine listing for proper alignment at the edges of the margins. This should help; if it doesn't, you will need to go line by line to find the problem.

Sometimes you get to the end and still can find no omitted data number. Is the computer wrong? Don't bet on it. The problem here is usually a period typed in place of a comma. This would make a statement like: `DATA 77,54,32,71, 10`, which has five separate numbers, turn into: `DATA 77,54,32.71,10`, which has only four. That little period is almost invisible among myriad lines of numbers, and most people would rather hear fingernails on a chalkboard than go through them one by one.

So, do it the easy way. If you find yourself in this position, check each `DATA` line with `EDIT`. If we enter `EDIT` and search for the period, `S.`, the cursor will move to the end of a good line or stop on the period we've been looking for. Change it and you're on your way. Don't forget to mark it in the book as a problem, in case you need to find it again.

We now come to the infamous FC (Function Call) Error. This accounts for most of the one-way trips into The Bug Zone.

Let's look at a few possibilities with an FC Error in Line 100: `100 PLAY"T255L355;O1;ABCDEF;XZ$;"`. Everything in the line looks OK. The 'O' is an 'O' and not a zero, quotes are there, 255 is the maximum legal amount for tempo and length, 1 is legal for the octave, the note names are proper, and the semicolons are really semicolons. So why still an FC Error in 100?

The only culprit left to cause a problem is `XZ$`, so now we must find `Z$` and check it out. If it's bad, the computer came to Line 100 in good faith and did what it was told, but when it smacked into `Z$`, it found someone asked it to do something illegal for the `PLAY` command. Presto — The Bug Zone.

To find `Z$`, we have to look at Line 50: `50 Z$="CCCAAABBBQ4ACEGF"`. Looks OK, but wait. The `Q` before the `4` doesn't make sense; it should be an `O` for octave. The mistake could just as easily have been any letter other than A through G or a command not allowed in `PLAY`. So, we see here how a mistake way up in the program can affect a line anywhere.

The `DRAW` command is another good place for problems, since countless letter/number combinations are used to create a particular screen image. How about an FC Error in Line 100 again: `100 DRAW"BM125,95;S63;E30R10D9 L12;XA$;"`.

Aha, the obvious problem is the illegal number for the `SIZE` command. It can only be a maximum of 62. We'll fix it and all will be well. Unfortunately, we still have an FC Error, so let's find where `A$` is created: `10 A$="U4R3G9L 3U7H3U5R4785F9R6"`.

Remember, you must know something about the parameters allowed in BASIC commands. If you do, you find that `A$` calls for a line to be drawn 4,785 points to the right. When you check the listing you find out it should have been `R47D5`.

FC bugs can take on a wide variety of disguises: `PUT` parameters must equal their repsective `GET` partners, `PRINT @`*XXX*, can be no more than 511, and line commands must not exceed 256 horizontal and 192 vertical. The possibilities are endless, and we can't cover them here. The solution is to break the problem down into small parts starting with the called line number, then search for the other areas brought into play to make that line work. By doing this, you'll eventually escape The Bug Zone.

A final hint concerning breaking the large program down into small parts. Don't be afraid to insert a `GOTO` or `STOP` command in a listing to test the waters. Things go by rapidly when the computer works, so you need to center in on your problem.

If, for example, a `PAINT` command makes color spill out of your graphics try this:

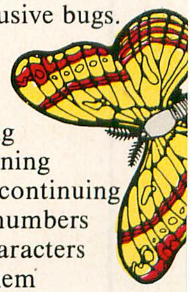
```
10 DRAW"BM125,96R40D40L40U38"
20 PAINT(130,100),4,3
```

Put `15 GOTO 15` in and check whether the line makes a complete container for the paint. You won't see it until it is too late. Then fix the `DRAW` statement and remove the `GOTO`. If the container is complete and there is still a problem, double-check the paint coordinates by changing `PAINT` to a `PSET(130,100)`, put in `25 GOTO 25` and see where the dot sets. If the listing is correct you won't need this, but mistakes do happen.

For number variables like `10 X=X*2` or `200 LINE(X,30)-(X+7,120), PSET`, the program will work for a moment unitl X gets too big to be legal. If it's part of a larger program, put a stop on Line 201 and ask the computer to `?X`. What if it says `X=250`? No good, because the second part of the line command adds `7` to `X` and therefore equals `257`, which is not allowed. Your problem then becomes the `X=X*@` statement, which maybe needed to be an `X=X+2`.

So, don't be discouraged by an occasional voyage into The Bug Zone. Those more experienced have spent many an hour saying nasty things to their CoCo while learning to discover elusive bugs. Just remember to:

1. Learn the rules
2. Compare with the listing
3. Save to tape before running
4. Check each line before continuing
5. Double-check address numbers
6. Be careful of similar characters
7. Narrow down the problem
8. Don't be in a hurry



You will soon find you've acquired a key that unlocks the many doors you may encounter on your next trip into The Bug Zone.

(Questions about this article may be directed to the author at 12474 Starcrest #204, San Antonio, TX 78216, 512-496-5783. Please enclose an SASE for a reply when writing.)

Create your own zany puzzles

CoCo-Nect-A-Dot

By Eric White

From time to time, I enjoy exploring the graphics capabilities of the CoCo. The Color Computer's Extended BASIC is a very powerful construction set. It can provide hours of fun and occasionally frustration. With it you can successfully create a variety of interesting and useful programs.

CoCo-Nect-A-Dot is one such program, using commands such as `DRAW`, `LINE`, `PAINT`, `GET` and `PUT` as the main building blocks. Explored in this program is the incorporation of a simple data interpreter. By coding each dot puzzle in a standard format, the puzzle can be displayed by simply processing the puzzle data through the interpreter. Once the user interface is finished and operating, additional puzzles can be created by entering more puzzle data.

CoCo-Nect-A-Dot accepts input from either the joystick port or keyboard. Press the firebutton on the desired joystick to select it as the input device. I will be using the keyboard throughout the rest of the program operation instructions. The active keys are the arrow keys and the space bar.

There are three menu options available: Dots, Lines and Color. To select a new puzzle, move the pencil with the arrow keys until the point of the pencil is on the box marked Dots, then press the space bar.

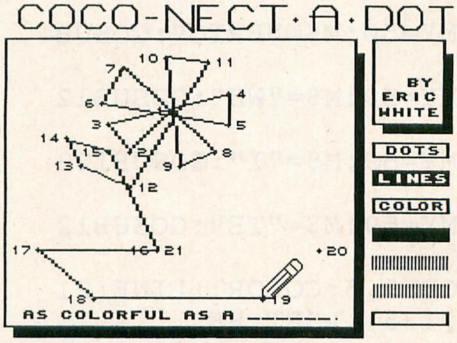
The Lines menu item is automatically selected when the program first starts, and after each new puzzle has been constructed. Lines is the drawing mode used to connect the dots. Position the pencil point where you want to tack a line down and press the space bar. Next, move the pencil to where you want the line to stop and press the space bar a second time.

Once your puzzle is complete, you may want to add a little color. Move the pencil point to the box marked Color and press the space bar. A flashing box will surround one of four color bars located at the bottom right of the screen. Use the up- and down-arrow keys to move the flashing box to the desired color and press the space bar to select that color. Next, position the pencil point where you want to add

Eric White is a self-taught programmer with a graphic arts background, who has been writing software for five years. He lives in Altamont Springs, Fla., and has coauthored many programs in association with WHITESMITH.

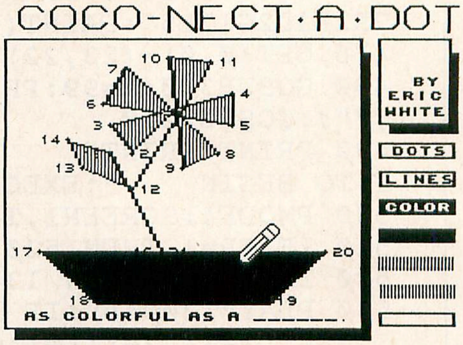
color and press the space bar to fill the area.

The program consists of nine sections. Lines 50 to 390 are for device input, lines 400 to 650 are pencil position update, lines 660 to 980 draw the main screen, and lines 990 to 1170 are the puzzle data interpreter. Lines 1180 to 1320 do Hi-Res text printing, lines 1330 to 1630 are the menu options, lines 1640 to 1760 have the puzzle data, lines 1770 to 2200 are the Hi-Res character data and program variables, and lines 2210 to 5000 are the start-up display.



To create a new puzzle, simply add puzzle data in this order: x position (0-255) for hint message, y position (0-191) for hint message, and the hint message string. Next, each point of the puzzle is described by the x (0-255), and y (0-191), `R` or `L` (which puts the dot's number on the right or left of the dot), and `0,0,END` (which is used to end the puzzle's data).

Note: The x coordinate must be divisible by 4 and the y coordinate must be divisible by 3, so the pencil point can be placed exactly on the dots. With a little planning, almost any simple shape can be encoded into a *CoCo-Nect-A-Dot* puzzle.



(You may direct questions about this program to the author at P.O. Box 609, Altamonte Springs, FL 32715, 305-834-0493. Please enclose an SASE when writing.) □

	1430 231
220 4	1610 120
450 78	1720 241
620 9	1840 52
810 45	2040 94
960 18	2240 149
1190 247	END 98

The listing: COCONECT

```
10 ' 8503.10/23:00 MOD:8607.26
20 CLEAR200:PCLEAR8
30 'POKE65495,0'SPEED POKE
40 GOTO 1760
50 '
60 'JOYSTICK ROUTINES
70 '
80 PLAY"L150ABCDEFG":A$=INKEY$
90 FR=0:P=PEEK(65280):AR=JOYSTK(
0):BR=JOYSTK(1):AL=JOYSTK(2):BL=
JOYSTK(3)
100 IF KJ<>1 THEN IF INKEY$<>""
THEN KJ=1:GOTO 80
110 IF KJ<>2 THEN IF P=126 OR P=
254 THEN KJ=2:GOTO 80
120 IF KJ<>3 THEN IF P=125 OR P=
253 THEN KJ=3:PLAY"L150ABCDEFG":
GOTO80
130 ON KJ GOTO 190,260,310
140 '
150 'DEVICE 1 = KEYBOARD
160 'DEVICE 2 = RIGHT JOYSTICK
170 'DEVICE 3 = LEFT  JOYSTICK
180 '
190 'KEYBOARD DETECTION
200 IF PEEK(345)=247 THEN POKE 3
45,255:FR=1:RETURN
210 IF PEEK(343)=247 THEN POKE 3
43,255:A=A-1
220 IF PEEK(341)=247 THEN POKE 3
41,255:B=B-1
230 IF PEEK(342)=247 THEN POKE 3
42,255:B=B+1
240 IF PEEK(344)=247 THEN POKE34
4,255:A=A+1
250 RETURN
260 'RIGHT JOYSTICK DETECTION
270 A=AR:B=BR
280 IF (P AND 3)<3 THEN FR=1
290 RETURN
300 '
310 'LEFT  JOYSTICK DETECTION
320 '
330 A=AL:B=BL
340 IF (P AND 3)<3 THEN FR=1
350 RETURN
360 '
370 PCOPY5TO1:PCOPY6TO2:PCOPY7TO
3:PCOPY8TO4:RETURN
380 FORU=1TO4:PCOPY U TO U+4:NEX
T:RETURN
390 PUT(210,79)-(253,119),K,PSET
:RETURN
400 '
```

```
410 'DRAW & GET PENCIL
420 '
430 PMODE4,1:PCLS1:COLOR0
440 DRAW"BM0,22;"+P$
450 GET(0,0)-(23,22),P
460 PCLS:COLOR1:DRAW"BM0,22;U5E1
7R2F3D2G17L5":PAINT(2,17),1,1
470 GET(0,0)-(23,22),M
480 GOSUB370:X=99:PRINT@96+32+32
,"";:GOSUB2270
490 PRINT:PRINT"     PRESS ANY KE
Y TO BEGIN     ":EXEC44539
500 PMODE4:SCREEN1,1
510 IF FR=1 THEN 520 ELSE 550
520 IF X>194 THEN 1340
530 PLAY"T200AB":IF L=0 AND TP=0
 THEN L1=X:L2=Y:L=1:GOTO550 ELSE
 IF TP=1 THENGOSUB370:PMODE3,1:
PAINT(X,Y),CO,1:PMODE4,1:GOSUB38
0:GOTO560
540 IF L=1 THEN PMODE3,5:COLOR1:
LINE(L1,L2)-(X,Y),PSET:PMODE4:L=
0
550 GOSUB90:SCREEN1,1:IF A=C AND
 B=D THEN 510
560 C=A:D=B
570 X=C*4:IF X>232 THEN X=232
580 IF X<0 THEN X=0
590 Y=D*3:IF Y<24 THEN Y=24
600 IF L=1 AND TP=0 THEN PCOPY5T
O1:PCOPY6TO2:PCOPY7TO3:PCOPY8TO4
:PMODE3,1:COLOR1:LINE(L1,L2)-(X,
Y),PSET:PMODE4,1:GOTO620
610 PMODE4,5:GET(OX,OY-22)-(OX+2
3,OY),S,G:PMODE4,1:PUT(OX,OY-22)
-(OX+23,OY),S,PSET
620 PUT(X,Y-22)-(X+23,Y),M,OR
630 DRAW"BM=X;,=Y;C0"+P$
640 OX=X:OY=Y
650 GOTO550
660 '
670 'DRAW SCREEN
680 '
690 PMODE4,5:PCLS1
700 BD=1:S=18:MX=8:MY=1:DRAW"S15
":M$="COCO  NECT  A  DOT":GOSUB1
250
710 DRAW"BM81,8;S4U6BM166,8;"+D$
+"BM198,8;"+D$
720 PMODE3,5:COLOR1
730 LINE(0,20)-(200,185),PSET,B
740 LINE(6,186)-(200,191),PSET,B
F
750 LINE(200,28)-(205,191),PSET,
BF
760 LINE(210,20)-(250,68),PSET,B
770 MX=214:MY=113:M$="COL":GOSUB
1190
```

```
780 MX=236:MY=113:M$="OR":GOSUB1
190
790 MX=214:MY=97:M$="LINES":GOSU
B1190
800 MX=218:MY=81:M$="DOTS":GOSUB
1190
810 LINE(251,28)-(256,73),PSET,B
F
820 LINE(216,69)-(256,73),PSET,B
F
830 MX=230:MY=42:M$="BY":GOSUB12
30
840 MX=216:MY=50:M$="ERIC":GOSUB
1230
850 MX=214:MY=59:M$="WH":GOSUB12
30
860 MX=228:MY=59:M$="I":GOSUB123
0
870 MX=234:MY=59:M$="TE":GOSUB12
30
880 BD=0:PMODE3,5:COLOR1:LINE(21
0,128)-(253,135),PSET,BF
890 COLOR2:LINE(210,144)-(253,15
1),PSET,BF
900 COLOR3:LINE(210,160)-(253,16
7),PSET,BF
910 COLOR0:LINE(200,15)-(208,18)
,PSET,BF:COLOR1:LINE(210,176)-(2
53,183),PSET,B
920 LINE(210,79)-(253,87),PSET,B
930 LINE(210,95)-(253,103),PSET,
B
940 LINE(210,111)-(253,119),PSET
,B
950 GET(210,79)-(253,119),K,G
960 PUT(212,96)-(251,102),L,NOT
970 GOSUB1000:GOTO430
980 RETURN
990 '
1000 ' READ DATA & PLOT POINTS
1010 '
1020 DN=1
1030 PMODE4,5
1040 COLOR0
1050 READ MX,MY,M$:IF M$="OUT"TH
EN RESTORE:GOTO1050 ELSE GOSUB11
90
1060 READ PX,PY,OF$:IF OF$="END"
 THEN 1150
1070 IF OF$="R "THEN OF=8
1080 IF OF$="L "THEN OF=-6:IF DN
>9 THEN OF=-12
1090 DRAW"BM=PX;,=PY;"+D$:PX=PX+
OF:PY=PY-1:DRAW"BM=PX;,=PY;A1BD3
"
1100 IF DN<10 THEN DRAW N$(DN):G
OTO1130
1110 DN$=STR$(DN)
```

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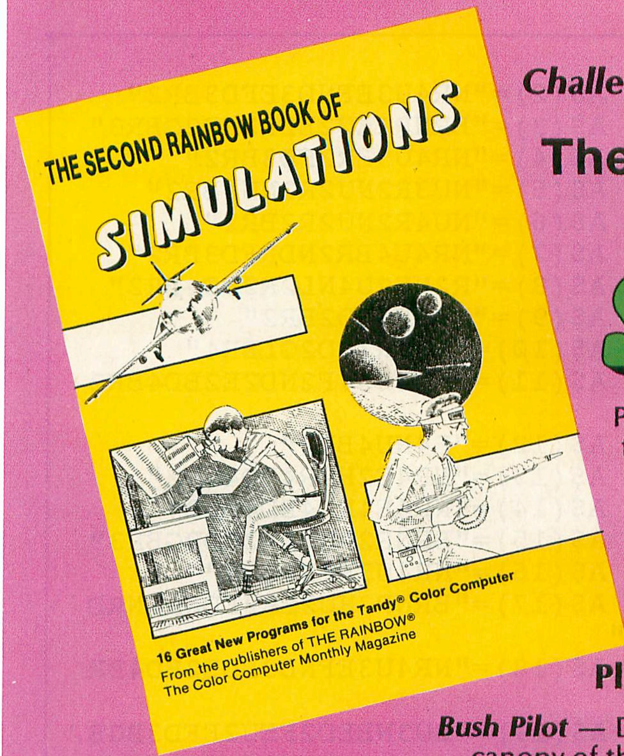
```
1120 DRAW N$(VAL(MID$(DN$,2,1)))
+"BL6BU6"+N$(VAL(RIGHT$(DN$,1)))
1130 DN=DN+1
1140 GOTO1060
1150 'FINISHED READING DATA
1160 DRAW"A0"
1170 RETURN
1180 '
1190 'HI-RES PRINTING SHOP
1200 'NEEDS M$="MESSAGE"
1210 '       MX=X POS
1220 '       MY=Y POS
1230 DRAW"S4":S=8
1240 PMODE4,5:COLOR0
1250 FORM=1 TO LEN(M$)
1260 N=ASC(MID$(M$,M,1))-64
1270 IF N=-32 THEN MX=MX+6:NEXTM
:RETURN
1280 IF N=0 THEN LINE(MX,MY+4)-(
MX+6,MY+4),PSET:MX=MX+8:NEXT:RET
URN
1290 IF N=-18 THEN PSET(MX+2,MY+
4,0):NEXTM:RETURN
1300 DRAW"BM=MX;,=MY;A1C0"+A$(N)
1310 BX=MX+1:DRAW"BM=BX;,=MY;A1C
0"+A$(N)
1320 MX=MX+S:NEXTM:RETURN
1330 '
1340 ' MENU
1350 '
1360 IF X<210 THEN550
1370 IF Y>79 AND Y<88 THEN 1420
1380 IF Y>96 AND Y<104 THEN 1490
1390 IF Y>111 AND Y<120 THEN 153
0
1400 GOTO550
1410 '
1420 'DOTS
1430 '
1440 PLAY"T200CD":PMODE4,5:SCREE
N1,1:GOSUB390
1450 PUT(212,80)-(251,86),L,NOT
1460 COLOR1:LINE(2,21)-(198,184)
,PSET,BF
1470 L=0:GOSUB1000:GOSUB390:PUT(
212,96)-(251,102),L,NOT:GOSUB370
:PMODE4:SCREEN1,1:TP=0:GOTO570
1480 '
1490 'LINES
1500 '
1510 PLAY"T200CD":L=0:TP=0:PMODE
4,5:GOSUB390:PUT(212,96)-(251,10
2),L,NOT:GOSUB370:GOTO570
1520 '
1530 'COLOR
1540 '
1550 PLAY"T200CD":OO=B:PMODE4,5:
GOSUB390:PUT(212,112)-(251,118),
L,NOT:GOSUB370
1560 L=0:TP=1:PMODE3
1570 GOSUB90
1580 IF K>1 THEN B=INT(B/16) ELS
E B=B AND 3
1590 COLOR1:LINE(209,B*16+127)-(
255,B*16+136),PSET,B:COLOR0:LINE
(209,B*16+127)-(255,B*16+136),PS
ET,B:OB=B
1600 IF FR=0 THEN 1570
1610 CO=PPOINT(235,B*16+129)
1620 B=OO:GOTO570
1630 '
1640 ' DOT DATA
1650 '
1660 DATA 4,175,WHEN YOU WISH AP
ON A @@@@.,100,36,R ,140,148,R ,
30,72,L ,160,72,R ,52,148,L ,100
,36,L ,0,0,END
1670 DATA 16,175,YOU ARE MY SWEE
T @@@@@.,108,167,R ,168,99,R ,17
2,67,R ,140,48,R ,104,67,L ,76,4
8,L ,44,67,L ,48,99,L ,108,167,L
,  0,0,END
1680 DATA 12,175,LIKE A BOLT OF
@@@@@@@@.,176,36,L ,48,95,L ,100
,103,R ,28,169,L ,164,106,R ,120
,87,L ,176,36,R ,0,0,END
1690 DATA 44,175,LITE AS A @@@@.
,56,160,L ,172,104,R ,80,36,L ,5
6,160,R ,160,32,R ,80,36,R ,172,
104,L ,0,0,END
1700 DATA 12,175,SHINES LIKE A @
@@@@@@.,24,68,R ,99,160,L ,64,68
,L ,99,36,L ,136,68,R ,99,160,R
,184,68,L ,24,68,L ,80,36,L ,120
,36,R ,184,68,R ,0,0,END
1710 DATA 22,175,YOUR MY @@@ @@
@@@.,124,132,L ,148,72,L ,164,82
,R ,152,108,R ,132,118,L ,156,56
,R ,36,56,L ,68,132,R ,184,132,R
 ,136,148,L ,56,148,R ,16,132,R
,68,132,L ,0,0,END
1720 DATA 22,175,YOU @@@@@ UP MY
 LIFE.,72,32,R ,128,32,R ,156,10
4,R ,88,104,L ,72,148,L ,84,160,
R ,76,168,L ,124,168,R ,116,160,
L ,128,148,R ,112,104,R ,44,104,
L ,72,32,L ,0,0,END
1730 DATA 12,176,AS COLORFUL AS
A @@@@@@.,96,60,L ,72,84,R ,60,6
8,L ,128,50,R ,128,68,R ,56,56,L
 ,68,36,L ,120,84,R ,100,92,L ,9
2,30,L ,116,32,R ,72,104,R ,44,9
2,L ,36,76,L ,60,84,L ,88,140,L
,20,140,L ,52,168,L ,148,168,R ,
180,140,R ,88,140,R ,0,0,END
1740 DATA 0,0, OUT
```



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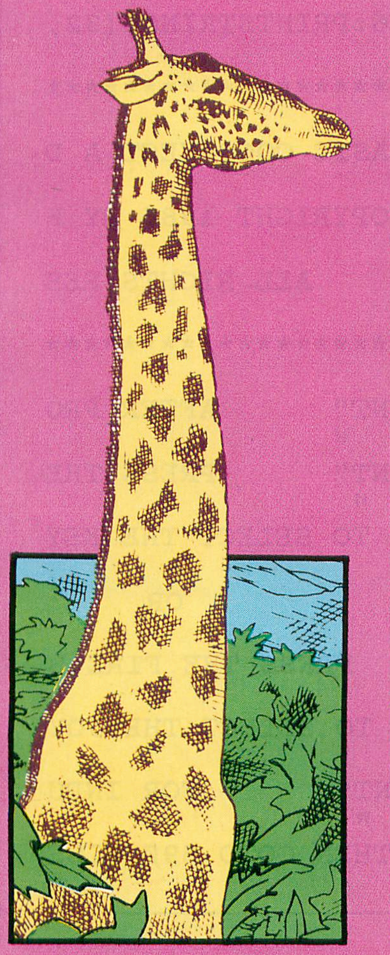

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```
1750 '
1760 DIM P(13),M(13),S(13),A$(26
),N$(25),K(80),L(10)
1770 A=54:B=15:OY=45:OX=216:KJ=1
:X=OX:Y=OY
1780 '
1790 ' CHARACTER DATA
1800 '
1810 D$="EFGHRBU3" 'DOT
1820 P$="U5E15F5G3H3G11BF2E11H4E
5R2F3D2G17L5E"
1830 N$(0)="BRNR2HU2ER2FD2GBR3"
1840 N$(1)="BEHR4BD2BR2"
1850 N$(2)="U3EFD3R2NU4BR2"
1860 N$(3)="U3EFND2EFD3BR2"
1870 N$(4)="BU3NR4F3NU4BR3"
1880 N$(5)="NU4R2U3EFD3BR2"
1890 N$(6)="BU3BNED2FR2HU2EFD2GB
R3"
1900 N$(7)="U4RF3BD2BR2"
1910 N$(8)="BRHU2EFND2EFD2GHGBR5
"
1920 N$(9)="BRHU2ENR2FD2GBR2BEU2
HB"
1930 A$(1)="BRNR3HU2ERND4R2BD4BR
2"
1940 A$(2)="NR4U3EFND3EFD3BR2"
1950 A$(3)="BRNR2HU2EBR2FD2GBR3"
1960 A$(4)="NR4U3ER2FD3BR2"
1970 A$(5)="NU3R2NU2R2NU4BR2"
1980 A$(6)="NU4R2NU2R2BR2"
1990 A$(7)="NR4U4BR2NDRFD3BR2"
2000 A$(8)="R2NR2U4NL2R2BD4BR2"
2010 A$(9)="BU2R4BD2BR2"
2020 A$(10)="BU4R3FD2GLBR4"
2030 A$(11)="NR4BU4F2ND2E2BD4BR2
"
2040 A$(12)="R4NU4BR2"
2050 A$(13)="NR4E2H2R4BD4BR2"
2060 A$(14)="NR4E4NL4BD4BR2"
2070 A$(15)="BRNR2HU2ER2FD2GBR3"
2080 A$(16)="NR4U3EFD3BR4"
2090 A$(17)="BRNR2HU2ER2FDNNLNRD
GBR3"
2100 A$(18)="NR4U3EFND3BDE2BD4BR
2"
2110 A$(19)="BU3NBED2FEU2EFD3BGB
R3"
2120 A$(20)="U2NU2R4BD2BR2"
2130 A$(21)="NR3BU4R3FD2GBR3"
2140 A$(22)="NR2BU4R2F2G2BR4"
2150 A$(23)="NR4BU4R4G2F2BR2"
2160 A$(24)="E4BL4F4BR2"
2170 A$(25)="BU4F2NG2R2BD2BR2"
2180 A$(26)="U4F4NU4BR2"
2190 '
2200 FORX=1TO16:PRINTSTRING$(32,
32);:NEXTX
2210 PRINT"*********************
***********";
2220 PRINT"* BASIC COCO-NECT A D
OT  V:1.0 *";
2230 PRINT"* COPYRIGHT 1986 BY E
RIC WHITE *";
2240 PRINT"*      ALL RIGHTS RES
ERVED     *";
2250 PRINT"*********************
***********";
2260 PRINT:PRINT"      AFTER PRO
GRAM STARTS    "
2270 PRINT:PRINT"      PRESS THE
 SPACEBAR      "
2280 PRINT"    TO SELECT THE KEY
BOARD    "
2290 PRINT"                   OR
      "
2300 PRINT"     PRESS THE FIRE B
UTTON    "
2310 PRINT"    TO SELECT THE JOY
STICK    "
2320 PRINT:PRINT"       FOR INPU
T DEVICE       "
2330 IF X<>99 THEN GOTO 690 ELSE
 RETURN
```

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Here's what you need to know to have a healthy, happy organization

The Care and Feeding of a CoCo Club

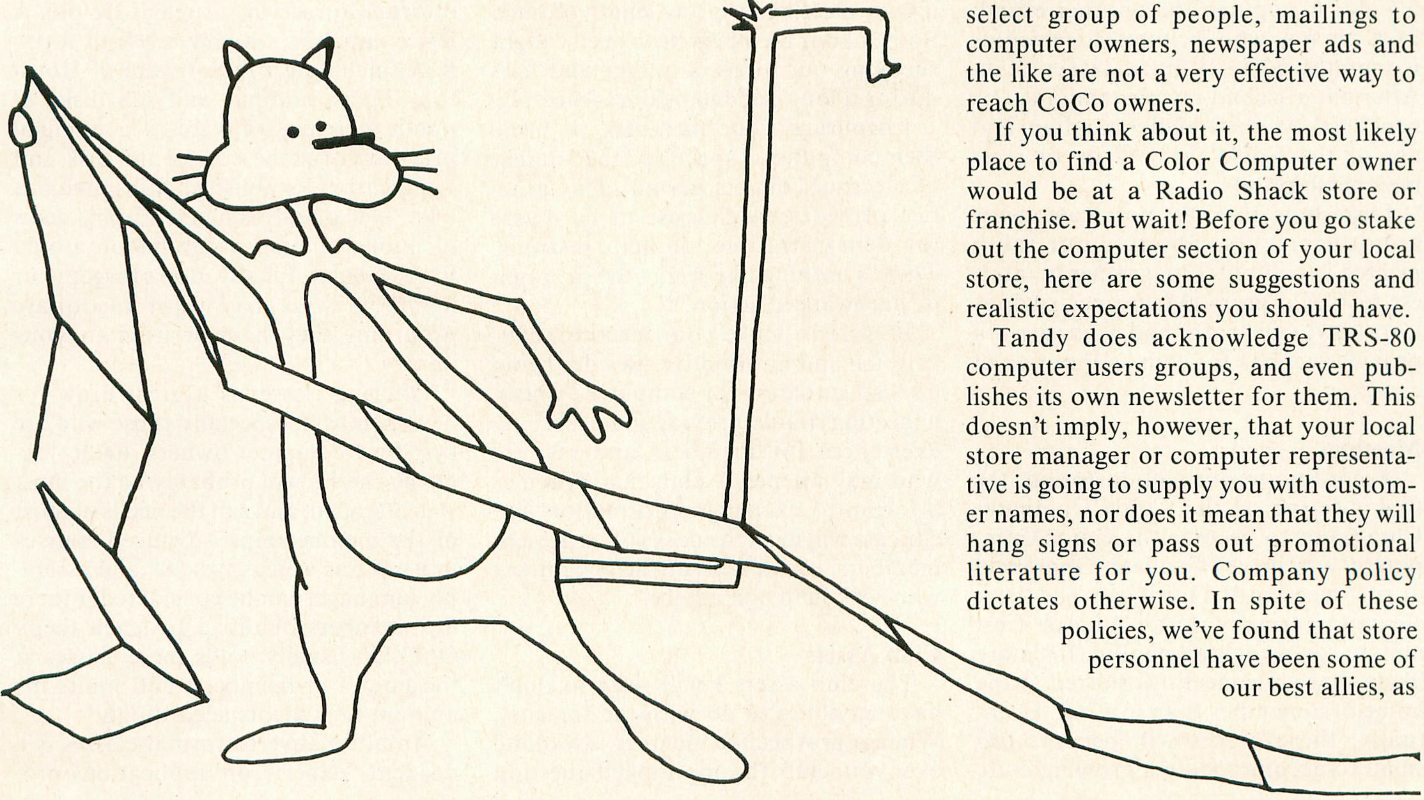
By Mark Haverstock

Are you a member of a Color Computer club? If you are, you're in good company. In the October 1986 RAINBOW, there were approximately 146 CoCo clubs listed in the United States and Canada. This doesn't even take into account clubs that have Color Computer SIGs, or ones that have yet to make themselves known to the CoCo Community.

Sometimes, these clubs start from small and humble beginnings. Often, a few friends who have a common interest in the CoCo get together for informal meetings, and soon find themselves attracting other enthusiasts who want to share their ideas and problems. Other clubs form out of the frustrations found in their present users groups. Our club, for example, came about as a result of finding no Radio Shack computer users groups in the Youngstown area. The group that was formed by five owners of the early Color Computers now boasts a membership of over 100, and will celebrate its fifth birthday this year.

As a member of this modestly successful computer club, I'd like to share a few tested hints to help your CoCo club grow and thrive with a little involvement from your officers and members.

Mark Haverstock teaches computer applications and language arts classes for the Boardman Schools in Youngstown, Ohio. He is also editor of the C3 Crier, *newsletter of the Color Computer Club, Inc., of Canfield, Ohio.*



Membership

The most important ingredient in any club is a pool of active members. After you've gotten your crew of friends and acquaintances together, how do you attract new members? You're dealing with a fairly narrow group: those interested in the Radio Shack Color Computer. These people are probably already owners or prospective owners of this particular computer. To find this select group of people, mailings to computer owners, newspaper ads and the like are not a very effective way to reach CoCo owners.

If you think about it, the most likely place to find a Color Computer owner would be at a Radio Shack store or franchise. But wait! Before you go stake out the computer section of your local store, here are some suggestions and realistic expectations you should have.

Tandy does acknowledge TRS-80 computer users groups, and even publishes its own newsletter for them. This doesn't imply, however, that your local store manager or computer representative is going to supply you with customer names, nor does it mean that they will hang signs or pass out promotional literature for you. Company policy dictates otherwise. In spite of these policies, we've found that store personnel have been some of our best allies, as far as referring potential members to us by word of mouth.

Often, customers will ask if there are any local Color Computer clubs, or seek technical help or advice that store salespeople cannot provide. We regularly mail newsletters and a few information sheets about our club to local stores. On the average, we gain three to six members per month who mention they heard about us at a Radio Shack store.

Other stores that sell computer supplies, software and related products can help with membership referrals. We also find that providing them with monthly newsletters and general information sheets helps remind them of us, and in turn generates new members.

Listing club information on local BBS systems is another way of recruiting potential members who have modem capabilities. Leave a message on the board about your club; better yet, ask the SysOp to put information about your club in a more prominent place, such as the bulletin section.

Other users groups can also be a source of new members. I'm not suggesting that you proselytize from other clubs, but there are two situations you should consider: 1) a person who owns a Color Computer and another brand; 2) a person who belongs to a Color Computer SIG within a larger club. After all, a second membership may be beneficial to their understanding and use of the CoCo, as well as to your membership rolls.

Last, but certainly not least, have announcements about your club printed in computer magazines of interest to CoCo users. Magazines such as RAINBOW, *CoCo Ads* and *Spectrogram* provide sections for club listings free of charge.

Meetings

According to our club historian, the first meeting of the Color Computer Club (later to become the Color Computer Club, Inc. of Canfield, Ohio) held its first meeting at a local bar. The then-elected secretary scrawled our first minutes on a cocktail napkin. It's more likely that your meetings started at the home of a member than in a bar. Eventually, these places will become too small to accommodate a growing club. The next question is, where can you hold your meetings?

The most likely (and cheapest) candidates for meeting places are schools, libraries, churches and lodges. Most of these places will provide facilities at a nominal charge, or no charge at all. Some restaurants have meeting or community rooms that are free for the asking or may be provided for free if your meeting agenda happens to include ordering a meal or snack. Least desirable from the standpoint of cost is a rented room or hall.

If there is a charge involved, ask your members to each donate a dollar toward the cost of the meeting room. If the collection exceeds the cost of the room, you may eventually decide to do what we did. Any excess went to purchasing a door prize for the next meeting. This is one way to take care of the surplus, as well as providing an added incentive to attend each month.

When planning meeting activities, the best policy is to take care of the business meeting first, when you have everyone's attention. Whatever time is left can be devoted to demonstrations, help sessions, lectures, etc. Remember, the mind only absorbs what the seat can endure, so frequent breaks are a must if your meeting lasts any length of time. Some of our members have been caught sneaking out to get a burger and fries during a long-winded business meeting.

Encourage your members to bring their computers if space and the number of electrical outlets permit. This practice provides easy access to hardware for demonstrations or help sessions. There's nothing like seeing the program or hardware in action.

Be sure to make your meetings educational and informative. Besides being a social gathering for computer owners, a meeting should provide some learning exeriences for members and visitors who may attend. A club that provides a forum to exchange information and educate will meet the needs of its present members, as well as attract beginners who seek help and advice.

Club Assets

The club assets I will refer to don't have anything to do with the treasury. When a prospective member is looking over your club, the one implied question always in his or her mind is, "What's in it for me?" A good club will provide services to attract and keep members.

One of the most valuable services we've found is providing a club library of public domain programs. This is a great attraction for new computer owners who have little or no software. They can borrow a wide array of programs without making any major investment.

Keep your library public domain only! There are several reasons for this. First, it's cost efficient. Public domain programs cost the club nothing, except for the cassettes or disks on which they are stored. Secondly, the issue of program privacy becomes non-existent. Members, if they desire, can copy these programs legally. Public domain programs have no strings attached. In contrast, licensing agreements in commercially produced programs may limit use to the original buyer only, making them unsuitable for a lending library. If a member illegally copies a program, both the member and club could be liable.

There are many places a club library can obtain public domain software. Programs can be downloaded from BBS systems, and the Color SIGs on information services, such as Delphi. A few companies who advertise in RAINBOW, including PD Software of Houston, Texas, compile and sell disks of public domain software at a nominal price to cover the cost of the disk and duplicating. Established clubs, like our own, will often exchange library disks of public domain programs on a one-for-one basis. Finally, don't forget your members who may want to donate programs they have written to your library.

Offering classes is a great draw for new members, especially those who are first-time computer owners. BASIC language classes will probably be the most well attended, and suit the needs of most of the membership. Advanced courses in BASIC, as well as PASCAL and assembly language, can be considered if there are members qualified to teach them. Our club usually holds these classes at the homes of members, and limits the amount of students accordingly.

An alternative to formal classes is a resident "expert" on applications programs. Incorporated into some of our meetings have been demonstrations of specific programs, such as a particular word processor or filing program. These "experts" are members who are thoroughly acquainted with the programs and give either a small group demonstration or one-on-one help to members.

A club BBS system can also be an inducement for prospective members. It can provide an instant means of communication between club members and a current update on club activities and concerns. Our club BBS is open to all, but members have several reserved sections and privileges not available to the public.

Since the purchase of equipment and phone costs can quickly go beyond the ability of a club to support it, sponsorship of a club member's existing board is an attractive alternative. Sharing the cost of monthly phone charges is one way a SysOp and club can benefit each other.

Newsletters

One visible sign of a growing club is a newsletter. It may start from humble beginnings on a single copied sheet, or be a mini-magazine with regular columns, programs and tutorials. Whatever size or format, we've found this to be one of the club's greatest assets. Our members appreciate, even look forward to, the arrival of a monthly newsletter.

Getting a newsletter started requires the efforts of several dedicated members. I emphasize the word several here for a good reason. A single editor cannot go it alone. A good newsletter needs people who can write and communicate clearly, have a talent for graphic arts, and editors who have a good working knowledge of grammar and spelling.

Articles from members are crucial to the success of any club newsletter. As in many clubs, most of the articles submitted are from officers and a handful of regular contributors. To promote writing for our club newsletter, we've offered some incentives that have been a modest success. Each member who has an article printed in the newsletter receives a one-month extension on his club membership. Periodically, programming contests are held to solicit programs for publication. The winning program is published, and the winner receives a prize or gift certificate for his/her efforts.

To make things simpler for the editor, our newsletter requires submissions on tape or disk from a word processor, written in ASCII format. That way, the editor only needs to load the file into his word processor, make corrections, and print out the article. The articles and artwork are then pasted up on layout sheets and sent to the printer.

If your club can afford it, offset printing by a professional printer produces the best quality newsletters. A good alternative for budget-conscious clubs is to find a professional printer who has a high-speed copier. Most of these copiers will print both sides and collate at a reasonable cost.

Money Raising Activities

To support a newsletter, BBS and other club activities, you'll need to have a treasury with sufficient funds. Dues for membership will always be a significant form of income, but usually won't be enough to cover a club's entire expenses. Money-raising activities now become a major consideration. Try to avoid money-raising activities that require a substantial cash outlay in advance.

Raffles can be a hit or miss proposition. In the past, our club has held raffles for two Color Computer systems; one was successful and one barely covered expenses. There is an obvious element of risk if you can't at least break even. One type of raffle that involves no investment is a "50/50 raffle," in which the proceeds are evenly distributed between the club and the winner. The 50/50 raffle has been successful at both meetings and membership drives.

Traditional money raisers such as candy sales are possibilities if you can form a good working relationship with the supplier. Many of these fund-raising companies will buy back unopened boxes of items that have not been sold. Also, they may not bill you for the merchandise immediately. This gives the club an opportunity to pay the bill from the first round of sales money that is turned in. Whatever you choose to sell, be sure you have support from your members, as well as a sales plan from the supplier that is to your liking.

Final Thoughts

These are just a few suggestions that will contribute to the growth of a Color Computer club. Of course, this is not the final word on how to run a club, nor is it intended to be. The ideas are ones that have worked for us over the last few years. I'd welcome comments on what projects and ideas have worked for your particular club.

(Questions about this article may be addressed to Mr. Haverstock at 6835 Colleen Drive, Youngstown, OH 44512. Please enclose an SASE when writing.)

Two-Liner Contest Winner . . .

Use the joystick to make your player avoid the potholes. This one is great and is even more difficult when using the high-speed poke.

The listing:

```
10 IFN=0THENCLS3:PLAY"L255O3ABGF
EDCCC":PRINT@0,"SCORE:";SC:X=31:
Y=31:K=K+2:FORT=1TOK+10:SET(RND(
63),RND(26)+1,2):NEXTT ELSE C=JO
YSTK(0):IFC<10THENX=X-1ELSEIFC>5
3THENX=X+1
20 Y=Y-1:IFPOINT(X,Y)=2THENPRINT
"FINAL SCORE:";SC:END ELSE SC=SC
+1:PRINT@0,"SCORE:";SC:IF Y<2THE
NN=0:GOTO10 ELSE N=1:SET(X,Y,5):
PLAY"L255O1CC":FORT=1TO75:NEXTT:
SET(X,Y,3):GOTO 10
```

Dean Amo
Wethersfield, CT

(For this winning two-liner contest entry, the author has been sent copies of both *The Rainbow Book of Simulations* and its companion *The Rainbow Simulations Tape.*)

* * *

Clubs, Clubs, Clubs

We compile a list quarterly of Color Computer Clubs because of the many requests we receive. CoCo Clubs may wish to exchange newsletters, share ideas for topics of discussion at monthly meetings, etc.

Please let us know if we have omitted any clubs and send us *complete up-to-date* addresses. Only those clubs that have signed our anti-piracy agreement form will appear in this listing of CoCo Clubs. Also, please notify us if you wish to add or delete any names on this list. Send your information to:

CoCo Clubs
THE RAINBOW
The Falsoft Building
P.O. Box 385
Prospect, KY 40059

* * *

ARIZONA

Tucson Color Computer Club, Bill Nunn, 9631 E. Stella, Tucson, 85730, (602) 721-1085

CALIFORNIA

Color America Users Group, Mark Randall, 2227 Canyon Road, Arcadia, 91006, (818) 355-6111

Los Angeles-Wilshire Color Computer Users' Group, Norm Wolfe, P.O. Box 11151, Beverly Hills, 90213, (213) 838-4293

California Computer Federation, (San Fernando Valley Chapter), Pete Ellison, 366 West Providencia Ave., Burbank, 91506, (818) 840-8902

California Computer Federation, (San Francisco Chapter), Art Murray, P.O. Box 7007, Redwood City, 94063, (415) 366-4560, BBS (415) 364-2658

The Davis CoCoNuts, Shneor Sherman, 1818 Haussler Dr., Davis, 95616, (916) 758-3195

South Bay Color Computer Club, Patricia Scheffer, 1435 W. 172nd Street, Gardena, 90247, (213) 371-2016

South Bay Color Computer Club, Bill Tillerson, 73 Alamitos Ave., Suite 2, Long Beach, 90802, (213) 432-3037

Ventura County Color Computer Club (VC4), Doug McLaughlin, Oxnard Public Library, 214 South "C" Street, Oxnard, 93030, (805) 984-4636 or BBS (805) 484-5491

Citrus Color Computer Club, Jack Brinker, P.O. Box 6991, San Bernadino, 92412, (714) 824-1866

South Bay Color Computer Users Group, John G. Say, 3117 Balmoral Drive, San Jose, 95132, (408) 923-2967

COLORADO

The ESCO Computer Club, David E. Schulz, 1299 Harrison Street, Denver, 80206, (303) 388-6988

DISTRICT OF COLUMBIA

Northern Virginia C.C. Club, Bruce Warner, 14503 Fullerton Rd., Dale City, Virginia 22193, (703) 690-2453

FLORIDA

Northwest Florida CoCo Nuts, Lee Gottcher, P.O. Box 1032, Fort Walton Beach, 32549, (904) 678-8894

Jacksonville Color Computer Club, William H. Brown III, 2411 Hirsch Ave., Jacksonville, 32216, (904) 721-0282

CoCo Chips Color Computer Club, 715 5th Avenue NE, Largo, 33540, (813) 581-7779

Broward County Color Computer Club, George Aloia, 2263 N.W. 65 Avenue, Margate, 33063, (305) 972-0975

South Brevard Color Computer Club, Benjamin S. Jerome, 496 Hillside Court, Melbourne, 32935, (305) 259-4609

CoCo Nuts of Central Florida, George Ellenburg, Box 593790, Orlando, 32859-3790, (305) 855-7867

Color-6809 Users Group, Emery Mandel, 4301 11th Avenue North, St. Petersburg, 33713-5207, (813) 323-3570, BBS (813) 321-0397

C.C. Club of Sarasota, Ernie Bontrager, 4047 Bee Ridge Rd., Sarasota, 33583, (813) 921-7510

GEORGIA

The Northeast Atlanta Color Computer Club, Joe Novosel, P.O. Box 450915, Atlanta, 30345, (404) 921-7418

The CoCo Cartel, Dennis M. Weldy, 4059 Acacia Drive, Columbus, 31904, (404) 576-5479

Atlanta Color Computer Users Group, Terry E. Love, 5155 Maroney Mill Rd., Douglasville, 30134, (404) 949-5356

ILLINOIS

Illinois Color Computer Club of Elgin, Tony Podraza, 119 Adobe Circle, Carpentersville, 60110, (312) 428-3576

Northern Illinois Color Computer Club, Kenneth Trenchard, Sr., 6145 N. Sheridan Road 30, Chicago, 60660, (312) 973-5208

Willow-Works Club, Kevin L. Adair, 5753 S. Laflin, Chicago, 60636, (312) 737-5716

Peoria Color Computer Club, Harold E. Brazee, 102 Twin Oak Court, East Peoria, 61611, (309) 694-4703

Glenside Color Computer Club, Ed Hathaway, 8 W. Stevenson Drive, Glendale Heights, 60139, (312) 462-0694

Kitchen Table Color Computer Group, Robert Mills, P.O. Box 464, Hanover, 61041, (815) 591-3377

Motorola Microcomputer Club, Steve Adler, 1301 Algonquin Rd., Schaumburg, 60196, (312) 576-3044

Chicago OS-9 Users Group, John Chasteen, 480 Gilbert Drive, Wood Dale, 60191, (312) 860-2580

INDIANA

Three Rivers Color Computer Club, R.R. 3, Box 269, Angola, 46703

CoCo Program Exchange, Erik Merz, 3307 Arrow Wood Dr., Fort Wayne, 46815, (219) 749-0294

Indy Color Computer Club, Kevin S. Jessup, Sr., P.O. Box 26521, Indianapolis, 46236, (317) 873-5808

Southern Indiana Computer Club, Route 1, Box 459, Mitchell, 47446

Michiana CoCo Club, Clay Howe, 310 S. Jefferson St., Sturgis, 49091, (616) 651-4248

IOWA

CoCo Questers, Scott Bellman, 2420 Salem Court, Bettendorf, 52722, (319) 359-7702

Metro Area Color Computer Club (MACCC), David E. Hansen, 3147 Avenue J, Council Bluffs, 51501, (712) 323-7867

Mid Iowa CoCo, Terry G. Simons, 1328 48th Street, Des Moines, 50311, (515) 279-2576

Dubuque Tandy Users Group, Wesley Kullhem, 1995 Lombard, Dubuque, 52001, (319) 556-4137

KANSAS

KC CoCo Club, Gay Crawford, P.O. Box 11192, Kansas City, 66111, (913) 764-9413

Micro 80 Users Group, Kevin Cronister, 2224 Hope, Topeka, 66614, (913) 272-1353

Color Computer Club of Wichita, William Wales, 220 East Harry St., Lloyd Electronics, Wichita, 67220, (316) 685-9587, BBS (316) 685-8752

KENTUCKY

Perry County CoCo Users Group, Keith W. Smith, General Delivery, Hardburly, 41747, (606) 439-4209

LOCO-COCO, Jim Spillman, 2405 Woodmont Dr., Louisville, 40220, (502) 454-5331

LOUISIANA

Cajun CoCo Club, Rick Herbert, P.O. Box 671, Crowley, 70526, (318) 788-3148

MAINE

Tandy Computer Club, Delmer Cargill, P.O. Box 428, Westbrook, 04092, (207) 854-2862

MASSACHUSETTS

Greater Boston Super Color Users Group, Robert Biamonte, 6 Boulder Drive, Burlington, 01803

Massachusetts CoCo Club, Jason Rahaim, Spring St., Lunenberg, 01462, (617) 582-6514

CLUB 6809, Jean Salvas, 204 East Street, Springfield, 01104, (413) 734-5163

MICHIGAN

Color C.H.I.P.S., Jack Pieron, 3175 Oakhill Place, Clarkston, 48016, (313) 627-4358

CCUG (Color Computer Users Group), Rich Van Manen, O-599 Lake Michigan Dr., Grand Rapids, 49504, (616) 453-8351

Tandy Users Group of Grand Rapids, Robert M. Worth, Jr., 1726 Millbank S.E., Grand Rapids, 49508 (616) 245-9324

Greater Kalamazoo Color Computer Club, Jim Rix, 1835 Chevy Chase Blvd., Kalamazoo, 49008, (616) 344-7631

Greater Lansing Color Computer Users Group, P.O. Box 14114, Lansing, 48901

Michiana CoCo Club, Clay Howe, 310 S. Jefferson St., Sturgis, 49091, (616) 651-4248

MISSISSIPPI

Singing River C.C. Club, Mark Welch, 3605 Vancleave Rd., # 118, Gautier, 39553, BBS (601) 875-8688

Gulf Coast Color Computer Assoc., Ed Keels, 22 Christy Cove, Gulfport, 39503, (601) 832-1210

Jackson Color Computer Club, Dorothy N. Welch, 424 Church Street, Madison, 39110, (601) 856-7255

CoCo Art Club, Joel Bunyard, Rt. 16, Box 11, Meridian, 39301, (601) 483-0424

MISSOURI

North County 80 Group, Tom Vogel, 12 Ville Donna Ct., Hazelwood, 63042, (314) 739-4078

Mid-America Color Computer User's Group, Jerry Morgon, 807 Ponca Drive, Independence, 64056, (816) 796-5813

Coconuts, 1610 N. Marlan, Springfield, 65803

NEBRASKA

Siouxland Color Computer Club, Alan Pedersen, 611 D Street, South Sioux City, 68776, (402) 494-2284

NEVADA

C.A.T. F.U.N., Paul A. Osborne, 201 Miners Road, Fallon, 89406, (702) 423-5789

NEW JERSEY

West Orange CoCo Club, Gregg Favalora, 12 Blackburne Terrace, W. Orange, 07052, (201) 736-1748 (let ring 12 times)

Loco CoCo Club, Bud Lavin, 73B Wavercrest Ave., Winfield Park, 07036

Mercer County Color Computer Users Group, Richard C. Kelly, 1904 Country Lane, W. Trenton, 08628, (609) 883-9270

NEW MEXICO

Chaves County Color Computer Club, Lee Mitchell, 1102 Melrose Drive, Roswell, 88201, (505) 623-0789

NEW YORK

Adirondack CoCo Club (Albany Chapter), Ron Fish, Box 4125, Albany, 12204, (518) 465-9793

Adirondack CoCo Club, (Greene County Chapter), Pete Chast, P.O. Box 61, Athens, 12015, (518) 945-1636

Adirondack CoCo Club (Glens Falls Chapter), Richard Mitchell, 39 Center St., Fort Edwards, 12828

Island Color Computer Club, Joseph Castelli, P.O. Box 901, Bellmore, 11710, BBS (516) 783-7506

Kings Byte CoCo Club, Morty Libowitz, 1063 East 84th St., Brooklyn, 11236, (718) 763-4233, BBS (718) 837-2881

C.C. Club of Central N.Y., Joseph Short, 248 S. Fourth Ave., Ilion, 13357, (315) 895-7730

Rockland County Color Computer Users Group, Harold L. Laroff, P.O. Box 131, Monsey, 10952-0131, (914) 425-2274

Olean Area CoCo Users Group, Herman L. Smith, P.O. Box 216, Olean, 14760, (716) 933-7488, BBS (716) 933-7489

The Rochester S-80 Computer Club, Inc., Gary Panepinto, P.O. Box 15476, Rochester, 14615, (716) 392-6133

New York Color Computer User Group, Carl Glovinsky, 15 Bolivar St., Staten Island, 10314, (718) 761-0268

NORTH CAROLINA

Bull City CoCo Users Group, Todd Wall, 5319 Durand Drive, Durham, 27703, (919) 598-1348

Raleigh Color Computer Club, David Roper, P.O. Box 680, Garner, 27529

OHIO

Central Ohio Color Computer Club, Jim Upperman, 5201 Wilcox Road, Amlin, 43002, (614) 876-1767

Color Computer Club, Inc., William Wills, P.O. Box 468, Canfield, 44406

Dayton Color Computer Users Group, Steven E. Lewis, 4230 Cordell Dr., Dayton, 45439, (513) 299-3060

Dayton Area Color Computer Users Group, David R. Barr, 2278 Yorkshire Pl., Kettering, 45419, (513) 293-2228

Greater Toledo Color Computer Club, William Paul Saba Sr., 3423 Cragmoor Ave., Toledo, 43614, (419) 385-9004

Tri-County Computer Users Group, William J. Loeffler, 2612 Dale Avenue, Rocky River, 44116, (216) 356-0779

Miami Valley CoCo Club, Tim Ellis, 1805 W. Parkway Dr., Piqua, 45356, (513) 773-2244

OKLAHOMA

Central Oklahoma Computer Organization, Inc., Martin Schiel, 5313 Spitz Drive, Oklahoma City, 73135, (405) 670-6891

Green Country Computer Association, Michael Keller, P.O. Box 2431, Tulsa, 74101, (918) 245-3456 (DATA)

PENNSYLVANIA

HUG-A-CoCo, George Lurie, 2012 Mill Plain Court, Harrisburg, 17110, (717) 657-2789

Penn-Jersey Color Computer Club, P.O. Box 2742, Lehigh Valley, 18001

Skyline Color Computer Club of Berks County, Lewis F. Brubaker, 4874 Eighth Ave., Temple, 19560, (215) 921-3616

Pittsburgh Color Group, Ralph Marting, P.O. Box 351, West Mifflin, 15122, (412) 823-7607

RHODE ISLAND

New England COCONUTS, P.O. Box 28106, North Station, Providence, 02908

SOUTH CAROLINA

LoCo CoCo Club, Larry Coyle, 4334 Flynn Dr., Charleston, 29405, (803) 747-0802

Midlands 80 Computer Club, Frank Eargle, P.O. Box 7594, Columbia, 29202, TBBS (803) 791-7389

Spartanburg County CoCo Club, Lawrence Easler, Jr., Rt. 1 Highway 221, Spartanburg, 29302, (803) 578-3120

TENNESSEE

Tri-Cities Computer Club, Gary Collins, P.O. Box 4506 CRS, Johnson City, 37602-4506, (615) 929-1862

Foothills Micro-Computer Club, Aaron Sentell, P.O. Box 1541, Maryville, 37801, (615) 982-4629

TEXAS

The San Antonio Color Computer Club, James Leatherman, 2430 Rawhide Lane, San Antonio, 78227

UTAH

Salt City CoCo Club, Dennis Mott, 720 E. Browning Ave., Salt Lake City, 84105, (801) 487-6032, BBS (801) 487-6787

VIRGINIA

Northern Virginia C.C. Club, Bruce Warner, 14503 Fullerton Rd., Dale City, 22193, (703) 690-2453

Central Virginia Color Computer Club, Roger Lee, Rt. 2 Box 175, Madison Heights, 24572

Color Company, Rick Blouin, 12007-C3 Greywing Sq., Reston, 22091, (703) 860-9297

Richmond Area Color Computer Organization, William Mays, 6003 Westbourne Drive, Richmond, 23230, (804) 282-7778

WASHINGTON

Northwest Computer Club, Larry Haines, East 2924 Liberty, Spokane, 99207, (509) 483-5547

Mount Rainier Color Computer Club, Ron Amos, 2450 Lenore Drive N., Tacoma, 98406, (206) 752-8735

WEST VIRGINIA

Mil-O-Bar Computer Club, Jim LeMaster, P.O. Box 130, Ona, 25545, (304) 743-4752 after 4 p.m.

Blennerhassett CoCo Club, David Greathouse, 1306 Wells Circle, Parkersburg, 26101

WISCONSIN

Southern Wisconsin CoCo Club, David C. Buehn, 24607 67th Street, Salem, 53168, (414) 843-3830

CANADA

ALBERTA

Bonnyville User Group (BUG's), Doug MacDonald, Box 2071, Bonnyville, T0A 0L0, (403) 826-4790

The Calgary Color Computer Club, P.O. Box 22, Station M, Calgary, T2P 2G5

Edmonton CoCo Users Group, Dexter Dombro, P.O. Box 4507 Stn. South, Edmonton, T6E 4T7, (403) 439-5245

BRITISH COLUMBIA

Vancouver Colour Computer Club, Box 76734, Stn S, Vancouver, V5R 5S7

Salmon Arm CoCo, David Coldwell, RR #4, Site 26 Comp. 13, Salmon Arm, V1E 4M4

MANITOBA

Winnipeg Micro-80 Users Group, Robert Black, 1755 King Edward St., Winnipeg, R2R 0M3, (204) 633-7196

NEW BRUNSWICK

Campbellton 6809E Users Group, Blaine Arsenault, 80 Deny Street, Atholville, E0K 1A0, (506) 753-4769

NOVA SCOTIA

Halifax Dartmouth CoCo Users Group, Eugene Naugler, P.O. Box 572, Dartmouth, B2Y 3Y9

Colour Computer Halifax User Group (CoCo Hug), Paul A. Power, 6354 London St., Halifax, B3L 1X3, (902) 455-6341

ONTARIO

ESSA Color Computer Club, Albert L. Ley, 40 Perry Street, Barrie, L4N 2G3, (705) 728-9481

Kingston CoCo Club, Kenneth Bracey, 316 Westdale Ave., Apt. 4-C, Kingston, K7L 4S7, (613) 544-2806

K-W CoCo Club, P.O. Box 1291, Station C, Kitchener, N2G 4G8

London CoCo Nuts Computer Club, Harry K. Boyce, 180 Concord Road, London, N6G 3H8, (519) 472-7706

Niagara Regional CoCo Club, Gerry Chamberland, 6843 Cumberland Crt., Niagara Falls, L2H 2J9, (416) 357-3462

Ottawa 6809 Users Group, Norm Shoihet, 1497 Meadowbrook Road, Ottawa, K1B 5J9, (613) 741-1763

Sarnia Computer Users Group, J. Verdon, P.O. Box 1082, Sarnia, N7T 7K5, (519) 344-6985

QUEBEC

Club d'Ordinateur Couleur du Quebec, Inc., Centre de Loisirs St-Mathieu, 7110- 8e Ave., St-Michel, Montreal, H2A 3C4, (514) 270-7507

Club Micro Ordinateur de Montreal-Nord, Christian Champagne, 12365 Blv. Langelier #7, Montreal-Nord, H1G 5X6, (514) 323-5958

Club ORCO-RS, Jacques Bedard, 33 Lisiere, St-Constant, J0L 1X0, *(514) 632-4311*

Le Club Couleur du Nord, Gabriel Pigeon, C.P. 315, Barraute, J0Y 1A0, (819) 734-2577

SASKATCHEWAN

Saskatoon Color Computer Club, L. Curtis Boyle, 35 Bence Crescent, Saskatoon, S7L 4H9, (306) 382-1459, BBS (306) 384-8040

FOREIGN

AUSTRALIA

Blacktown City TRS-80 Colour Computer Users Group, Keith Gallagher, P.O. Box 264, Riverstone, New South Wales, 2765, (02) 627-4624

COCOPUG, Harry Murphy, 8 Lois Court, Regentsville, New South Wales, 2750

CoCoHUG (Color Computer Hobart Users Group), Robert Delbourgo, 15 Willowdene Avenue, Sandy Bay, Hobart, Tasmania, 7005

ISRAEL

The First Color Computer Club of Israel, J. Yosef Krinsky, 52 Ramot Polin, Jerusalem, Israel, Phone (02) 863-354

MEXICO

Mexcoco Users Group, Sergio Waisser, Paseo de la Soledad #120, Mexico City, D.F., 53920, phone 294-36-63

the NETHERLANDS

Color Computer Club Benelux, Jorgen te Giffel, Eikenlaan 1, 4641 GB Ossendrecht, the Netherlands

PERU

Piura Color Computer Club, Carlos Alvarez, Box 142, AV. Guillermo Irazola, J-6 URB. Miraflores Castilla, Piura, Peru, phone (074) 327182

PUERTO RICO

Puerto Rico Color Computer Users Club, P.A. Torres, Cuernavaca 1699, Venus Gardens, Rio Piedras, Puerto Rico 00926, Phone (137) 755-7598

WEST GERMANY

First CoCo Club Hamburg, Theis Klauberg, 2345 Delaware Drive, Ann Arbor, MI 48103 *(temporary address).*

new clubs

Editor:

We would like to inform CoCo owners in the San Joaquin Valley of our new club. We are looking for new members to join us. We will have many activities, one being monthly meetings. Anybody interested in joining, please call (209) 646-2632 or write to me.

Matthew L. Reyna
695 'I' Street
Parlier, CA 93648

- I would like to announce a new Color Computer user group in the Orlando/Winter Park area. The club has its own BBS. Details about the BBS can be obtained at the club meetings which are the first Wednesday of every month at my condominium's clubhouse. To get directions, call (305) 855-7867 or write to me.

George M. Ellenburg
CoCoNuts of Central Florida
Box 5913790
Orlando, FL 32859-3790

- Anyone interested in joining the CoCo Trading Post Club, please write me.

Bart Stanley
490 Potts Road
Conyers, GA 30208

- I publish a newsletter called Lewis Clark Exchange and am currently looking for new members. I print ideas, programs and interesting articles. I would like to exchange newsletters with other clubs and organizations. For more information on subscribing or exchanging newsletters, write to me.

Leslie Miller
Lewis Clark Exchange
1130 Bryden Avenue
Lewiston, ID 83501

- I'm pleased to announce the formation of the COMPuter Assembly Serving Shelby (COMPASS) Club. COMPASS meets the second Monday of every month at 7:30 p.m. on the third floor of the First Christian Church in Shelbyville.

Duke Norris
P.O. Box 241
Shelbyville, IN 46176

- I would like to know if there is a CoCo users club in the Leavenworth area. Anyone knowing of one or anyone wanting to organize one, please contact me.

Michael Frick
839 Ottawa Street
Leavenworth, KS 66048

- We would like to inform your readers of the Ft. Meade Color Computer Club. Our meetings are held on the second and fourth Monday of each month. We meet at the Land, Sea and Air Recreation Center located in the N.S.A. complex at Ft. Meade. No dues are collected and all are invited to attend. We start at approximately 6:30 p.m. and cover a wide range of interests. For further information contact either Frank Powers (301) 262-9573 for the Washington area or Mike Clancy (301) 551-7520 for the Baltimore area.

Frank A. Powers
12207 Mackell Lane
Bowie, MD 20715

- The GOSUB TRS-80 Computer Club has been together for eight years. We are a Tandy computer club, with sections for all Tandy computers. We have a BBS that operates 24 hours a day at 300/1200 baud. You can reach it at (617) 756-1442. The club meets every third Sunday of the month at St. Peters-Marian High School on Grove Street.

Edward J. Donovan
357 June Street
Worcester, MA 01602

- The Tandy Users Group of Grand Rapids (formerly known as the Grand Rapids Area Tandy Users Group) meets on the third Tuesday of each month, 7 p.m., Radio Shack Computer Center, 3142-28th Street in Kentwood. Our group is represented equally by the MS-DOS, OS-9 and CoCo users. At the present time, there are no dues and membership is open to all, regardless of hardware.

Robert M. Worth, Jr.
1726 Millbank S.E.
Grand Rapids, MI 49508

- The Jackson Color Computer Club meets on the third Tuesday of each month, 7 p.m., V.A. Medical Center. For information, call (601) 856-7255 or write us.

Dorothy N. Welch
424 Church Street
Madison, MS 39110

- I would like to announce the start of the New York Color Computer Program exchange group. Our group wants to get public domain programs in circulation. We do print a newsletter which is filled with contests, facts and other interesting things. There is no fee. For information please write to us.

Larry Chattoo
230 Lott Avenue, Apt. 5-B
Brooklyn, NY 11212

- Announcing the formation of the CoCo Users Group of Elmira. For information write to us or call (607) 734-0065.

Bill Cecchini
P.O. Box 4181
Elmira, NY 14904

- It is with great pleasure that I announce the extension of the United States largest Color Computer user's group to the Enid and northwest Oklahoma area with the formation of the Enid Chapter, CoCo Inc. We have 20 members in our third month of existence and are growing rapidly. We offer the same benefits as the Oklahoma City parent organization; club disks monthly, a newsletter, a BBS and monthly meetings with seminars on BASIC, OS-9 and other points of interest to all CoCo users. Interested parties should contact their favorite Radio Shack dealer or write me.

David Graham
724 E. Maple
Enid, OK 73701

- The Williamsport Area Color Computer Club meets every third Wednesday of the month. If you have any questions, contact me at (717) 322-9715 or drop me a message on the Delphi CoCo SIG. We meet at 7 p.m. in the James V. Brown Library.

Christian Ross
(CGR)
Williamsport, PA

- A new club is being formed in the northern Virginia area. We are supported by two local BBSs and have started a public domain library with over 800 entries. We would also like to hear from other clubs about exchanging ideas, newsletters and anything else that will benefit the clubs involved. Our BBS support numbers are Handy Tandy (703) 532-5317 and CoCo Corner (703) 573-3362. Any interested party wanting more information about this club, please write to me.

Rick Blouin
12007-C3 Greywing Square
Reston, VA 22091

- The Richmond Area Color Computer Organization (RACCO) meets on the fourth Tuesday of each month. We publish a newsletter each month. For information call me at (804) 282-7778 or write to me.

Bill Mays
6003 Westbourne Drive
Richmond, VA 23230

- I am starting The Poor Man's CoCo Club. Although based in Wisconsin, CoCoists from anywhere around the world who want to see what owning a CoCo is all about should send an SASE to me.

Mark Andreessen
Rt. 2, Box 103W
New Lisbon, WI 53950

- We would like to announce the existence of the Bonnyville User Group (BUG's). Although we are an all-types of computer club, the majority of our members are CoCo users. We have a monthly newsletter as well as our own club BBS and other benefits. For more information, call Doug MacDonald at (403) 826-4790 or write to me.

Gerhard Wolf
P.O. Bag-R
Bonnyville, Alberta
Canada T0R 0L0

- The Calgary Color Computer Club is interested in exchanging newsletters with other clubs. Thank you RAINBOW for providing this service to the international community of CoCo users.

Charles E.S. Torrey
P.O. Box 22, Station M
Calgary, Alberta
Canada T2P 2G5

- The CoCo Co-op of Bridgetown has a new address (see below). We will send a newsletter and a public domain software disk when you pay the club registration fee. Write to me.

Lee Sutto
P.O. Box 565
Bridgetown, Nova Scotia
Canada B0S 1C0

- Announcing a new CoCo club as Les Cocologiques in the south shore of the Montreal area. For more information call (514) 647-1849 or (514) 465-3597. You can also write us.

Normand Nantel
105 Sacre Coeur, Suite 105
Longueuil, Quebec
Canada J4L 1A8

- I am pleased to announce the formation of Les Cocophiles Club in Legardeur, Quebec. For more information, please write to me.

Jean-Claude Larouche
17 Bord-de-l'Eau
Repentigny, Quebec
Canada J6A 3K2

- The Blackwood Computer Club is a new, non-profit computer club. There are no meetings or membership fee. The only cost will be postage for a newsletter that will be sent out every other month, depending on circulation. Write to us for more information.

Doug White
Box 38
Sylvania, Saskatchewan
Canada S0E 1S0

- I would like to announce a new CoCo club in Argentina. The Free CoCo Club has 25 members and the majority of us are electronics teachers at the high school or university level. We make programs about physics, chemistry, mathematics, electricity, electronics, business, statistics, etc. They are made in Spanish and some in English. We would like to communicate with others interested in the CoCo.

Miguel Angel Novoa
Thorne 1190
Codigo Postal 1406
Buenos Aires, Capital Federal
Argentina

- I would like to inform you of a new club for CoCo users in the western district of Melbourne. The Sunshine Color Computer Club meets on Thursday nights every three weeks (except during school holidays) in the computer room of the TAFE Building, Morris Street, Sunshine. For more information write to us: Sunshine Color Computer Club, P.O. Box 111, Sunshine 3020 VIC. Or give Ian Butriss a call at 03 314-3240.

Ian Mavric
32 Burnewang Street
Albion, VIC 3020
Australia

- We have a Christian Users Group operating in Australia of which I am the contact person. We would love to hear from similar minded CoCo users throughout the readership of your magazine from around the world.

Raymond L. Isaac, Lieutenant
P.O. Box 130
Hall & Residence
57 Wittenoom Street
Collie, 6225
Australia

- The First Color Computer Club of Israel is in need of public domain programs. Since we are a long distance call to all BBSs, we are asking for any individual/clubs to send us programs to add to our library. If requested, we will be happy to send you our current newsletter. Please send an SASE. We have a new mailing address and phone number. Phone city code (02) 863-354; please call 07:00-20:00 GMT.

J. Yosef Krinsky
52 Ramot Polin
Jerusalem, Israel

- Announcing The Great German CoCo-Cooks Club. We are only a few CoCo users, but we would like to get in contact with all German CoCo users and, of course, with CoCo users in every country.

Hans - Joerg Sebastian
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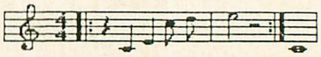

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Let the Little Ones Learn by Counting on CoCo

By Steve Blyn
Rainbow Contributing Editor

This month's program is one for the little folks — the preschoolers. It is always wise to try to interest preschoolers in using computers. This will help them to avoid fears and anxieties about computer usage that may develop later in life. Usually, a young child will want to "play with" the home computer if he or she has seen parents or older siblings using it. This has certainly been the case in my home. My youngest child has always wanted to imitate the activities of the rest of us. She is now 5 years old. Her first two years were spent observing computer use in the home and during the next three years, using it herself.

This program is meant to ease a young child into using a computer comfortably. It is simple, colorful, and presents a concept that most youngsters have experienced before — counting objects. A car will travel across the screen beeping its horn. Immediately afterward, a group of cars will appear on the screen. The child is required to count the cars and type in the correct answer. The number of cars varies randomly from two to eight. The computer displays the child's answer if he presses a number from one to eight. Other keys produce no response from the computer.

If a wrong answer is given, the computer displays it but makes no negative reaction. We are, after all, dealing with very young children and do not want the computer to present any unpleasant impressions to them. The child may continue to press keys until the correct answer is given. A happy tune accompanies a correct answer.

Sounds reinforce the visual picture of the number of cars. This is an extra aid to the child. Some may prefer to use the number of beeps as an initial aid to counting, and then use the pictures as a secondary source of counting. If the child becomes too reliant on counting the beeps, you can turn off the volume on your TV or monitor.

The words for the numbers are also displayed each time the child presses a number from one to eight. We felt that some of the children might be up to learning how to spell the numbers. Nursery schools and *Sesame Street* do a lot toward making our kids aware of the numbers and letters at an early age.

The `INKEY$` is used throughout this program to make it easier for the little ones to use the keyboard. It is sometimes difficult for them to coordinate pressing the correct letter and then finding the ENTER key. This becomes even more difficult on the new Color Computer 3. (The ENTER key is less prominent on the new computer and will no doubt present problems to adults and children alike for awhile.) The ENTER key is used only to go on to the next group of cars to count. Mom or Dad can provide some assistance if needed.

Lines 60-110 draw and print the original car across the screen. Line 120 changes the position of the car by three places, and the loop created by lines 40 and 130 moves the car along.

Lines 150 and 230 choose random numbers from one to four. The number of cars drawn will therefore be a number between two and eight. The cars are drawn in lines 160 through 290. Lines 300 to 320 create a box for the answer to be placed in.

Line 340 looks for the child's response. Lines 350 through 420 check to see whether that response was one of the acceptable answers (one through eight). If not, the program immediately looks for the next response. If an acceptable

---

Steve Blyn teaches both exceptional and gifted children, holds two master's degrees and has won awards for the design of programs to aid the handicapped. He owns Computer Island and lives in Staten Island, New York.

response was keyed in, it is printed and checked to see whether it is the correct answer by lines 460 and 470.

After the correct answer is given, a happy tune is played by Line 460 and the computer waits for the next instruction. Pressing ENTER gives another example; pressing the E key ends the program.

We hope that your young ones enjoy working with this program. We do suggest, however, that you stay with them to provide encouragement, help when necessary, and give a lot of praise for their accomplishments. □

The listing: CARCOUNT

```
10 REM"PRESCHOOL COUNTING CARS"
20 REM"STEVE BLYN,COMPUTER ISLAN
D,STATEN ISLAND,NY,1986"
30 BB=0
40 FOR B= 1 TO 9
50 CLS0:PRINT@96,STRING$(64,223)
;
60 B$=CHR$(165)+CHR$(172)+CHR$(1
74)+CHR$(172)+CHR$(170)
70 PRINT@27-BB,B$;
80 C$=CHR$(145)+CHR$(175)+CHR$(1
75)+CHR$(175)+CHR$(175)+CHR$(175
)+CHR$(175)
90 PRINT@57-BB,C$;
100 D$=CHR$(252)+CHR$(128)+CHR$(
128)+CHR$(252)
110 PRINT@91-BB,D$;
120 BB=BB+3:SOUND40,2
130 NEXTB
140 CLS0
150 A=RND(4)
160 FOR T= 1 TO A
170 PRINT@130+M,B$;
180 PRINT@160+M,C$;
190 PRINT@194+M,D$;
200 M=M+7:SOUND 200,2
210 NEXT T
220 M=0
230 B=RND(4)
240 FOR T= 1 TO B
250 PRINT@258+M,B$;
260 PRINT@288+M,C$;
270 PRINT@322+M,D$;
280 M=M+7:SOUND 200,2
290 NEXT T
300 PRINT@10,STRING$(11,255);
310 PRINT@74,STRING$(11,255);
320 PRINT@42,CHR$(255);:PRINT@52
,CHR$(255);
330 PRINT@47,"?";
340 EN$=INKEY$
350 IF EN$="1" THEN J=1:J$=" ONE
"
360 IF EN$="2" THEN J=2:J$=" TWO
"
370 IF EN$="3" THEN J=3:J$="THRE
E"
380 IF EN$="4" THEN J=4:J$="FOUR
"
390 IF EN$="5" THEN J=5:J$="FIVE
"
400 IF EN$="6" THEN J=6:J$=" SIX
"
410 IF EN$="7" THEN J=7:J$="SEVE
N"
420 IF EN$="8" THEN J=8:J$="EIGH
T"
430 IF EN$<>"1" AND EN$<>"2" AND
 EN$<>"3" AND EN$<>"4" AND EN$<>
"5" AND EN$<>"6" AND EN$<>"7" AN
D EN$<>"8" THEN 340
440 PRINT@47,EN$;
445 PRINT@461,J$;
450 C=VAL(EN$)
460 IF C=A+B THEN FOR T=1 TO 3:P
LAY"03;L30CEGGGFEDC":NEXT T:GOTO
 480
470 IF C<>A+B THEN 340
480 AN$=INKEY$
490 IF AN$=CHR$(13) THEN RUN ELS
E IF AN$="E" THEN 500 ELSE 480
500 CLS:END
```

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WISHING WELL

16K ECB

Understanding Relationships Between Fractions, Decimals and Whole Numbers

By Fred B. Scerbo
Rainbow Contributing Editor

Editor's Note: If you have an idea for the "Wishing Well," submit it to Fred c/o THE RAINBOW. Remember, keep your ideas specific, and don't forget that this is BASIC. All programs resulting from your wishes are for your use, but remain the property of the author.

Another new year is upon us. It is a time for reflection and a time for new resolutions. As I look back on the past year, I feel that a good deal of what I set out to do in the "Wishing Well" successfully came to pass. We have had games, educational programs and a heavy dose of tutorial approaches in the column as a whole. What does the future hold?

Well, with a little luck I hope to be able to introduce some CoCo 3 programs in the "Wishing Well" before the next year is out. However, I will make this one *firm* resolution: I will not forget the overwhelming numbers of you who have a CoCo 1 and 2. Knowing the vast numbers of RAINBOW readers who rely on these pages for software, I feel it will be a long time until the CoCo 3 users are in the majority. Therefore, fear not. I am not about to discard our trusty Color BASIC and Extended BASIC just because something new has come down the line.

Fred Scerbo is a special needs instructor for the North Adams Public Schools in North Adams, Massachusetts. He holds a master's in education and has published some of the first software available for the Color Computer through his software firm, Illustrated Memory Banks.

Now, let's get down to business for this month.

Mail and Wishes

During the last year, the "Wishing Well" has become much more difficult to prepare. There are several reasons for this. First, many readers have suggested programs that are virtually impossible to create in BASIC. I cannot write programs that jump in and out of OS-9 or alter the configuration of the BREAK key so it re-boots your disk system. These things are just not possible without getting into assembly language. Remember, the "Wishing Well" was designed to take ideas you submit and synthesize them into real programs in BASIC. Sometimes, ideas from four or five different sources will serve as the stimulus for a different program. Remember, creating a brand new program each month does take time and is not the easiest task in the world.

Secondly, some of the most requested ideas readers have submitted can no longer be created in the "Wishing Well." The most requested features are sequels to *Rockfest, Baseball Fever, Football Fever* and most of my other graphic designs.

Unfortunately, our legal department has informed me that we can no longer reproduce logos and symbols that are protected under copyright. We have not had a major problem with this in the past, but the legal department is paid to warn magazines about areas where trouble could develop. Therefore, don't expect *Rockfest III* or *Basketball Fever.* The lawyers say no.

A few readers have written expressing outrage that I did not drop everything to write their program to project pork belly futures or to calculate schedules for school crossing guards. Some ideas are just too limited and I cannot devote a whole column to a program that only two or three RAINBOW readers can use. My goal always has been to create programs that the greatest number can use. That's why I won't abandon CoCo 1 and 2 either.

A lot of recent mail has commended the Life Skills series and programs like *Color Change Quiz II.* Sheila Jackson from Moline, Ill., wrote that her two children use these programs extensively and asked for more of the same. Kenneth Burdon of Plaistow, N.H., echoed the same ideas in expressing thanks for programs like *Math Driller II*, which his grandchild uses.

Elementary educator Jack Lamoureaux also expressed a need for a program like these dealing with the issue of relationships between numbers. All of us have struggled with those less-than and greater-than signs, < and >. Therefore, the next Life Skills program, offered this month, will deal with number relationships and recognition. Mrs. Jackson, Mr. Burdon and Mr. Lamoureaux, this one's for you, as well as all the other "Wishing Well" readers who have a use for an educational program dealing with a valuable math skill.

The Program

Life Skills 5 is designed to fit into a 16K Color BASIC computer or a 20K MC-10 without modifications. Like most other Life Skills programs, this one has a variable skill level, and three different types of material are covered. On running the program, the user will be presented with three choices: fractions, decimals or whole numbers.

The program is written in such a way as to adjust the location of the numbers displayed on the screen, especially in the case of fractions.

If D is selected for decimals, the next line reads:

```
Select the number of
decimal places (2-6).
```

If F for fractions or W for whole numbers is pressed, the choice is:

```
Select the number of
number places (1-5).
```

Pressing the corresponding number gives the choice you desire. The next prompt asks:

```
Do you want to have
hints given? (Y-N)
```

By hints, I mean explaining what the greater-than (>) or less-than (<) signs stand for. If N is chosen, the multiple choice selections A through C will only have the signs shown.

Next, the screen gives us our first problem and says:

```
Look at the two values below.
The first number is . . .
the second number.
```

Below this are printed the two values, whether they are whole numbers, decimals or fractions. Next will be the three choices:

```
A) Greater than . . . >
B) Less than . . . <
C) Equal to . . . =
```

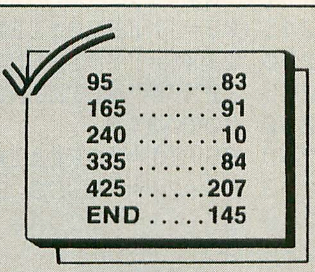
If no hints are given, only a row of dots and the signs will appear next to the letters. The user need only press the letter desired. If the answer is wrong, the screen displays:

```
Sorry, try again !!
```

If the answer is correct, the screen will say:

```
VERY GOOD! THAT IS CORRECT!
PRESS ENTER TO CONTINUE!
```

An arrow will also flash next to the correct response. Pressing ENTER advances to the next problem while pressing @ gives us our score card, which has now become a standard feature of all these educational programs. When the score card is on the screen, pressing Y reruns the program, pressing N ends it,



The listing: MATHQUIZ

```
10 REM****************************
15 REM* LIFE SKILLS MATH QUIZ    *
20 REM*  NUMBER RELATIONSHIPS    *
25 REM*   RECOGNITION SKILLS     *
30 REM*    BY FRED B.SCERBO      *
35 REM*      60 HARDING AVE      *
40 REM*  NORTH ADAMS,MA 01247    *
45 REM*   COPYRIGHT (C) 1986     *
50 REM****************************
55 CLS0
60 FORI=1TO32:PRINTCHR$(172);:NE
XT
65 FORI=1TO192:READA:PRINTCHR$(A
+128);:NEXT
70 FORI=1TO32:PRINTCHR$(163);:NE
XT
75 DATA109,104,96,109,104,100,11
0,108,106,109,108,109,,,30,28,26
,29,,,30,20,30,20,30,16,20,30,,2
1,28,29
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and pressing C continues the program already in progress.

I have not included the function of Computer Paced Learning introduced a few issues ago because it is not appropriate for this material. Still, you may adjust the level of the difficulty at the beginning of each run.

Like all my other educational programs, examining the listing will help you get an idea of how variables can be used to create multi-subject programs. Without the use of variables, it might be necessary to write three different programs to cover fractions, decimals and whole numbers. Study the listing and it might give you some ideas for your own programming skills.

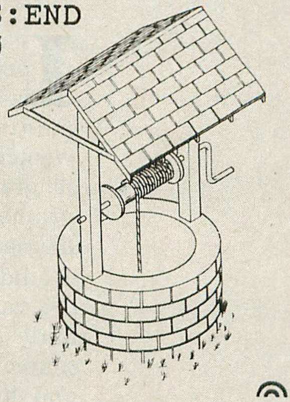
Conclusion

I hope all of you will find this program to be a valuable addition to your educational program library. If my mail has been any indication, many young CoCo users have been cutting their teeth on the software available only in these pages. Therefore, give me a hand in coming months by suggesting some other ideas for material and subjects to be covered in this type of program. Since our options are now so limited, as I mentioned earlier in the article, your input would be helpful.

Also, don't be hesitant to suggest an idea for a game. I have some ideas percolating and someone out there might just provide enough stimulus to get the idea going! See you next month! ☐

```
80 DATA101,,,101,,,106,96,104,10
1,,100,,,26,,24,21,16,22,16,,26,
,26,,16,26,,21,,20
85 DATA101,,,101,,,107,106,96,10
1,99,98,,,27,19,18,21,22,16,,,26
,,26,,16,26,,21,19,19
90 DATA101,,,101,,,106,104,,101,
,,,,,,26,21,20,18,,,26,,26,,16,2
6,,,,21
95 DATA101,,106,101,,,106,,,101,
,97,,16,26,,26,21,,20,18,,26,,26
,21,16,26,21,21,,21
100 DATA103,99,106,103,98,97,107
,,,103,99,103,,,27,19,26,23,18,,
27,17,27,17,27,23,17,27,23,21,19
,23
105 PRINT@293," NUMBER RELATIONS
HIPS ";
110 PRINT@325,"  RECOGNITION SKI
LLS  ";
115 PRINT@357,"    BY FRED B.SCER
BO   ";
120 PRINT@389,"  COPYRIGHT (C) 1
986  ";
125 PRINT@421," (F)RACTION,(D)EC
IMAL ";:PRINT@453,"  OR (W)HOLE
NUMBERS  ";
130 X$=INKEY$:IFX$=""THEN130
135 IFX$="F"THEN FR=1:GOTO190
140 IFX$="D"THEN FR=0:VL=32:A=0:
GOTO155
145 IFX$="W"THEN FR=0:VL=32:GOTO
190
150 GOTO130
155 PRINT@421," SELECT THE NUMBE
R OF ";:PRINT@453," DECIMAL PLAC
ES (2-6)";
160 X$=INKEY$:IFX$=""THEN160
165 X=VAL(X$):IFX<=1THEN160
170 IFX>6THEN160
175 N$=".":FORI=1TOX:N$=N$+"#":N
EXT
180 GOTO230
185 GOTO185
190 PRINT@421," SELECT THE NUMBE
R OF ";:PRINT@453," NUMBER PLACE
S  (1-5)";
195 X$=INKEY$:IFX$=""THEN195
200 X=VAL(X$):IFX<=0THEN195
205 IFX>5THEN195
210 A=10^X:N$="#":FORI=1TOX:N$=N
$+"#":NEXT
215 D$="  ":FORI=1TO6-X:D$=D$+"
":NEXT:FORI=1TOX:D$=D$+"-":NEXT:
GOTO230
220 VL=32
225 N$="###":GOTO230
230 L$=CHR$(91):R$=CHR$(93)
235 AR$="=>"
240 PRINT@421," DO YOU WANT TO H
AVE  ";:PRINT@453," HINTS GIVEN
? (Y-N) ";
245 X$=INKEY$:IFX$=""THEN245
250 IFX$="Y"THEN265
255 IFX$="N"THEN285
260 GOTO245
265 E$(1)="GREATER THAN.."
270 E$(2)="LESS THAN....."
275 E$(3)="EQUAL TO......"
280 GOTO290
285 FORI=1TO3:FORY=1TO14:E$(I)=E
$(I)+".":NEXTY,I
290 IF FR=1 THEN FG=X-5
295 B=RND(A):C=RND(A):K=RND(10):
IFK=10THENC=B
300 IF FR=0THEN315
305 B(2)=B:C(2)=C:B(1)=RND(A/10)
:C(1)=RND(A/10):IFK=10THENC(1)=B
(1)
310 GOTO330
315 B(1)=B:C(1)=C:IF FR<>1THEN33
0
320 K=RND(2):IFK=1THEN330
325 C(1)=C(1)*2:C(2)=C(2)*2
330 CLS:PRINT@34,"LOOK AT THE TW
O VALUES BELOW.   THE FIRST NUMB
ER IS ........   THE SECOND NUM
BER."
335 PRINT@168+VL-FG,"";:PRINTUSI
NGN$;B(1);:PRINT@178+VL-FG,"";:P
RINTUSINGN$;C(1)
340 IF FR<>1THEN355
```

```
345 PRINT@198,D$;:PRINT@208,D$;:
PRINT@232-FG,"";:PRINTUSINGN$;B(
2);:PRINT@242-FG,"";:PRINTUSINGN
$;C(2);
350 B=B(1)/B(2):C=C(1)/C(2)
355 PRINT@294,"A) "E$(1)L$">"R$
360 PRINT@326,"B) "E$(2)L$"<"R$
365 PRINT@358,"C) "E$(3)L$"="R$
370 X$=INKEY$:IFX$=""THEN370
375 IFX$="@"THEN465
380 IFX$<"A"THEN370
385 IFX$>"C"THEN370
390 IF B>C AND X$="A"THEN410
395 IF B<C AND X$="B"THEN410
400 IF B=C AND X$="C"THEN410
405 NW=NW+1:PRINT@422,"SORRY, TR
Y AGAIN !!";:FORI=1TO1000:NEXTI:
PRINT@422,STRING$(22,32);:GOTO37
0
410 NR=NR+1
415 IF B>C THEN SL=291:GOTO430
420 IF B<C THENSL=323:GOTO430
425 IF B=C THEN SL=355:GOTO430
430 NC=NC+1:PRINT@418,"VERY GOOD
!  THAT IS CORRECT!";:PRINT@483,
"PRESS <ENTER> TO CONTINUE!";
435 X$=INKEY$
440 PRINT@SL,AR$;
445 FORI=1TO10:NEXT:PRINT@SL,"
";:FORI=1TO10:NEXT
450 IFX$="@"THEN465
455 IFX$<>CHR$(13)THEN435
460 GOTO290
465 CLS:PRINT@101,"YOU TRIED"NC+
NW"PROBLEMS &":PRINT@165,"ANSWER
ED"NC"CORRECTLY"
470 PRINT@229,"WHILE DOING"NW"WR
ONG."
475 NQ=NC+NW:IF NQ=0THEN NQ=1
480 MS=INT(NC/NQ*100)
485 PRINT@293,"YOUR SCORE IS"MS"
%."
490 PRINT@357,"ANOTHER TRY (Y/N/
C) ?";
495 X$=INKEY$:IFX$="Y"THEN RUN
500 IFX$="N"THENCLS:END
505 IFX$="C"THEN290
510 GOTO495
```



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Bring your graphics to life with this two-face tutorial

The Case of the Shifty-Eyed Animation Tutor

By Bill Bernico

I have worked with graphics for years and it's become my favorite part of computing. Once I got the drawing, painting and circling down pat, I wanted a way to stay interested enough in graphics to continue writing programs. The next obvious step was animation — making my pictures move.

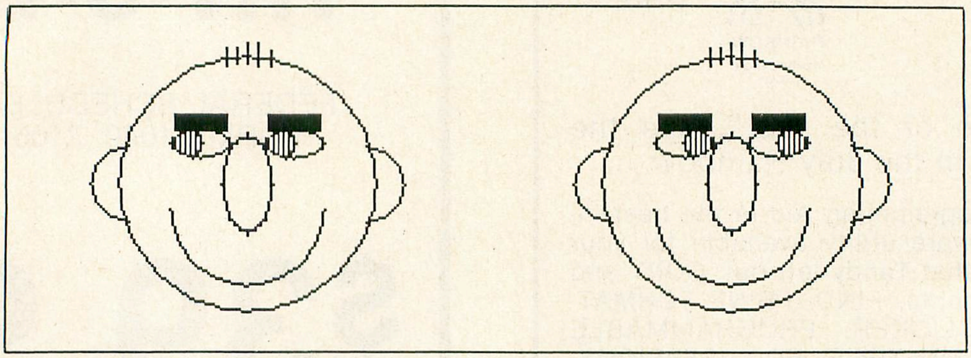
I did a little research and worked with the various commands until I got a fairly good grasp of the workings of simple animation. Once you know why and how things work for a simple program like this, you can adapt the procedure to more complicated drawings. The time spent understanding this technique is worth the effort when you see your creations move.

Drawing, erasing, and redrawing is slow and awkward. `GET` and `PUT` are fine for moving across the screen. But suppose you have a portion of your picture that only needs to move in place or alter itself. That's what this technique will teach. It's done with the `PCOPY` command.

The sample programs, *Face One* and *Face Two*, each draw a face. The only difference in the two drawings is the direction that this fellow is looking. *Face One* has the guy looking right and *Face Two* has him looking left. As you run *Face One*, it creates a binary disk picture file called `FACE 1.BIN`. *Face Two* creates `FACE 2.BIN`. Now that you have the two picture files on disk you can run *Facetest*.

Facetest is the program that brings all these processes together. First it `PCLEAR`s eight graphics pages. Then it loads `FACE 1.BIN` with an offset of 6144. This will store the picture starting on Graphics Page 5. Next, it loads `FACE 2.BIN` and stores it in memory. With the aid of the `SCREEN` command, the pictures are displayed one after another in rapid succession to create the illusion of animation.

The time delay in Line 160 determines how fast the eyes will shift. They will continue to shift until you press any key, which stops the process.



To save you a little typing time, *Face One* and *Face Two* are the same except for lines 110-140. You can type in *Face One*, save it and edit lines 110-140 to those lines from *Face Two*.

(Questions about this program may be directed to the author at 708 Michigan Ave., Sheboygan, WI 53081: 414-457-4861. Please enclose an SASE when writing.) ☐

Bill Bernico is a self-taught computerist who enjoys golf, music and programming. He is a drummer with a rock band and lives in Sheboygan, Wisconsin.

Listing 1: FACE ONE

```
10 'FACE ONE
20 'FROM KROMICO SOFTWARE
30 'BY BILL BERNICO
40 '
50 PMODE4,1:PCLS1:SCREEN1,1:COLO
R0,1
60 CIRCLE(128,96),50:CIRCLE(110,
80),12,0,.5:CIRCLE(146,80),12,0,
.5:CIRCLE(128,96),10,0,2
70 LINE(100,69)-(120,75),PSET,BF
:LINE(136,69)-(156,75),PSET,BF
80 CIRCLE(128,106),30,0,1,0,.5
90 DRAW"BM120,50U7BR4D6BR4U8BR4D
9BR5U6
100 CIRCLE(174,96),15,0,1,.75,.2
5:CIRCLE(82,96),15,0,1,.25,.75
110 CIRCLE(116,80),7,0,1,.33,.8
120 CIRCLE(152,80),7,0,1,.33,.8
130 POKE 178,1:PAINT(112,80),,0:
PAINT(148,80),,0
140 SAVEM"FACE 1",3584,9727,3584
```

Listing 2: FACE TWO

```
10 'FACE TWO
20 'FROM KROMICO SOFTWARE
30 'BY BILL BERNICO
40 '
50 PMODE4,1:PCLS1:SCREEN1,1:COLO
R0,1
60 CIRCLE(128,96),50:CIRCLE(110,
80),12,0,.5:CIRCLE(146,80),12,0,
.5:CIRCLE(128,96),10,0,2
70 LINE(100,69)-(120,75),PSET,BF
:LINE(136,69)-(156,75),PSET,BF
80 CIRCLE(128,106),30,0,1,0,.5
90 DRAW"BM120,50U7BR4D6BR4U8BR4D
9BR5U6
100 CIRCLE(174,96),15,0,1,.75,.2
5:CIRCLE(82,96),15,0,1,.25,.75
110 CIRCLE(104,80),7,0,1,.8,.18
120 CIRCLE(140,80),7,0,1,.8,.18
130 POKE 178,1:PAINT(108,80),,0:
PAINT(137,80),,0
140 SAVEM"FACE 2",3584,9727,3584
```

Listing 3: FACETEST

```
10 'FACE TEST
20 'FROM KROMICO SOFTWARE
30 'BY BILL BERNICO
40 '
50 PCLEAR8
60 CLS:PRINT"LOADING PICTURE FIL
ES...
70 PCLS1:COLOR0,1
80 LOADM"FACE 1",6144
90 LOADM"FACE 2
100 PMODE4,5:SCREEN1,1:GOSUB160
110 PCOPY 8 TO 4
120 PLAY"O4T60F
130 PMODE4,1:SCREEN1,1:GOSUB160
140 IF INKEY$<>""THEN170
150 GOTO 100
160 FORX=1TO300:NEXT:RETURN
170 CLS:PRINT"TEST COMPLETE...SU
CCESS
180 END
```

Hint . . .

Command Performance

Here is a tip for those with the new Color Computer 3. Tandy did a wonderful thing in eliminating some commands for Hi-Res graphics. When you issue the HSCREEN command, the screen is automatically cleared for you. Sounds great! But, what if you want to enter the Hi-Res screen without clearing it? Try entering POKE&HE6C6,33. This will cause the system to bypass the automatic HCLS. The original value for memory location $E6C6 is 141.

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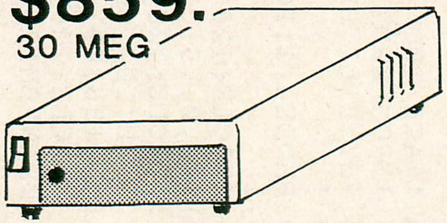

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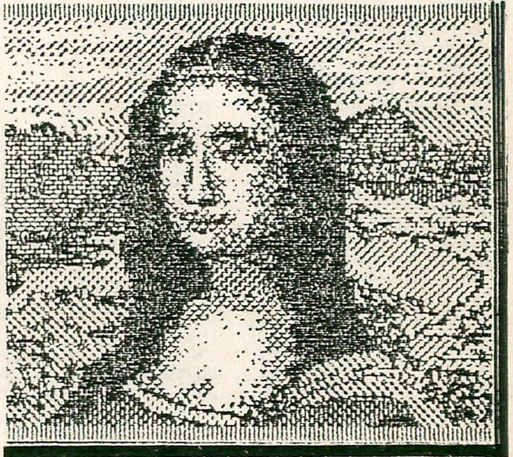

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The Formatting Review: MID$ Struts Its Stuff

By Joseph Kolar
Rainbow Contributing Editor

Knowing you are eager to continue your studies, `MID$` takes center stage today. Three listings plus a modification were prepared to reinforce your understanding of putting text onto the screen one letter at a time without any hands-on interference. As you will see, the programs are very short, considering what they do.

The actual text in the three programs is not to be taken seriously. If memory serves me right, I think that only one of the programs is factual. The others are overworked figments of a sick imagination. They are meant to be reading material for this tutorial.

Key in Listing 1 and run it. Impressed? List through Line 10.

We will use arrays to place each succeeding string of text onto the screen. Arrays should be dimensioned in a line near the beginning of a program. Line 6 is a good place to put `DIM A$(5)`. However, faithful CoCo allows for 10 items in an array without protest. That being the case, the line was omitted as superfluous.

Insert Line 6 `DIM A$(4)`, run it and get the BS Error. If you have more items to stuff into an array (in this case, `A$(5)`) and you do not reserve enough array containers to store all of them, CoCo shoots back immediately with a BS Error message. Change the `(4)` to `(5)` in Line 6. Leave it in the program; it doesn't do any harm.

Whenever you work with strings of text, enter `CLEAR 500` to reserve space in memory. Chances are you will need it, as you will soon see.

Look at Line 10. Almost all of the allowed characters that could be contained in `A$(1)` were stuffed in. In fact, if you get into the edit mode and take off the final quote mark and space over, the best you can do is add three more blank spaces before CoCo balks and hangs up.

If you care to find out `LEN(A$(1))` or the total number of characters/spaces in the program, without using any program line number, key in:

```
PRINT LEN(A$(1))
```

and press ENTER, or type:

```
PRINT LEN(A(1))+LEN(A$(2))
+LEN(A$(3))+LEN(A$(4))+LEN
(A$(5))
```

and press ENTER.

I enjoy using these calculator functions to extract information from a program in progress, because the program lines remain undisturbed.

Line 10 contains one complete sentence and part of a second sentence — as much text as was reasonably possible to cram into the container. Add the temporary lines:

```
11 PRINT A$(1);
12 GOTO12
```

and run. We did not bother to *locate* the text on any particular row. We just want to view it and check out the formatting, spelling and punctuation for a neat layout.

List Line 20. In this array unit, `A$(2)`, we completed the unfinished sentence and followed up with a complete sentence that ends the paragraph. Since we wanted a space after `huelgo`, we began our string with a space.

Delete Line 12. Add:

```
21 PRINTA$(2);
22 GOTO 22
```

and run. One substantial paragraph results!

Be aware of the importance of the semicolon. We will use the semicolon solely to put on all the text, one character/space at a time, without the use

---

Florida-based Joseph Kolar is a veteran writer and programmer and specializes in introducing beginners to the powers of CoCo.

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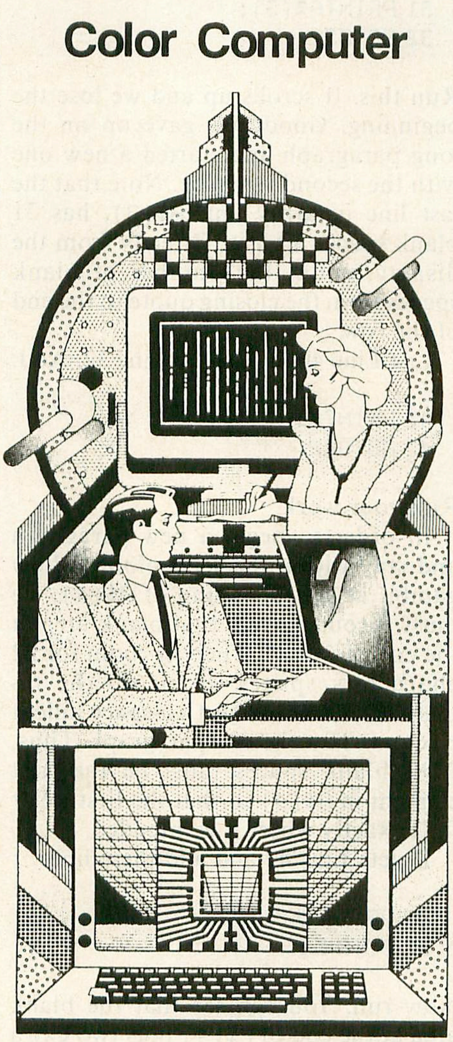

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of any locating point values or variables. If you want to give this technique a name, the Follow gambit is as good as any.

List Line 30. For demo purposes, we shall create an even larger paragraph. It is a new sentence, so two spaces are placed in front of the start of text. It contains two sentences. Delete Line 22 and add:

```
31 PRINTA$(3);
32 GOTO32
```

Run this. It scrolls up and we lose the beginning. Good! We gave up on the long paragraph and started a new one with the second sentence. Note that the last line in array unit `A$(3)`, has 21 blank spaces after it. Directly from the display, count the number of blank spaces from the closing quote to the end of the row.

List Line 40 and delete Line 32. Add:

```
41 PRINTA$(4);
42 GOTO42
```

Run your work.

In order to begin a new paragraph and stay within the semicolon, Follow gambit at the beginning of `A$(4)`, we must account for all that blank area at the end of `A$(3)`. There is room for 22 characters/spaces to fill up the remainder of the row. A two-space indent is required for the new paragraph. Thus, 22+2 blank spaces must be the first element in `A$(4)` so that the first letter falls exactly where it is intended.

Delete Line 42 and add these lines:

```
51 PRINTA$(5);
52 GOTO 52
```

Now run. You can see that the blank area at the end of `A$(4)` plus two extra indenting spaces set the `A$(5)` text in the correct location. We are satisfied with our layout. Look, Ma, no locations!

Delete lines 11, 21, 31, 41, 51 and 52. Run the result. The program should run slow enough for you to read along. Note that somewhat longer pauses after `flat` and `factor` are created. CoCo has to cycle (actually put on all those blank spaces) but this doesn't detract from the readability.

List lines 200 to 250. We have three nested loops. The inner one at Line 240 determines the length of the pause between the placement of each succeeding character/space. The middle loop, Line 220, is where `B` is the number of each character/space of the text as it is fingered in a particular array unit. It is to be printed, using `MID$`, where one letter in the Bth location in array unit `A$(A)`, is printed, after the previous letter, thanks to the semicolon. No doubt you could combine lines 210 and 220, but it makes more sense to the beginner to show it as two lines. The outer loop, at Line 200, chooses the array containers, `A$(A)`, to be worked on by CoCo in succession.

How would you tell CoCo to begin on the third row? Work it out!

Did you know that CoCo is an accomplished linguist? It can speak pure Jargonese. Save Listing 1 and type `NEW`. Key in Listing 2. If you are sure you have lines 200 to 240 exactly as listed, run. Do you want a translation? Then run again.

List lines 200 to 240. This is the nice tight routine with an assist from Line 5 that allows you to use a single array to write a neat program.

Let's fool around and listen to CoCo beat its gums. Insert `211 FOR B=1 TO LEN(A$(A)) STEP 3: PLAY"T240O 5L32CP32L16EP16L32GP8L88"`.

Turn up the volume and run. It is using a different dialect this time. Run for the translation.

By the way, if you want to begin displaying the text on some row other than the top one, insert at the beginning of Line 200 as many `PRINT:`s as the number of lines you want to drop down.

At this point, the `DEL211:` in Line 240 becomes harmless. Save Listing 2 and type `NEW`. Key in Listing 3 and run. This version is displayed with the `MID$` routine in lines 200 to 230. List lines 200 to 240 and you will see nothing you haven't tackled before. It is a very satisfactory version.

Nevertheless, blank rows divide each set of statements. Working them into a program where every bit of text is put on in succession, using an array item, makes CoCo demand that the empty rows be created inside array units.

List lines 10 to 40. `STRING$` would solve this problem. It would be necessary to fill the balance of Line 10, `A$(1)`, on the last row, with blanks. It's easy to count the number of remaining spaces (14). A complete blank row consists of 32 spaces. The blank spaces could be simulated by using `CHR$(143)`, which produces an invisible green square.

Line 20 told CoCo that in array unit `A$(2)`, a string of 46 green squares, using graphics block 143, were required. The Follow gambit would tack them at the end of `A$(1)`. They would also act as a pause routine to allow more time to read the text blocks.

To see this from another perspective, in Line 20, change `143` to `128` and run.

Replace `143` in Line 20. Save Listing 3. List lines 10 to 40, 50 to 60, 70 to 80 and 90 to 100. Note that no empty row was placed after Line 90, much less a new paragraph.

This was done on purpose to demonstrate the need for the `DIM` statement to dimension an array. Change Line 100, `A$(10)` to `A$(11)`. Then, create the spacing between blocks of text.

Add `95 A$(10)=STRING$(28+32, 143)`. Reformat Line 100 in order to make it into a new paragraph as originally conceived but not executed. Employing the Invisible Vertical Line ploy, the second through fifth rows should have the following words beginning at the left margin: `language`, `they`, `Saxon` and `large`. Make appropriate adjustments at the end of each row and remember to indent two spaces for the paragraph. (Refer to the modified listing if you are encountering difficulty.) Now run.

CoCo rebels and gives out a BS Error in Line 100. Sure! No provision was made for storing `A$(11)`. Try adding `5 DIM A$(11)` and run. Still no good. Press BREAK. CoCo breaks at Line 240. List lines 200 to 240. CoCo did what was expected of it. It ran `A$(1)` through `A$(10)` and relaxed. We failed to allow for `A$(11)`, where `A=11`. Modify by editing Line 200 to change `10` to `11`. Now run.

Save *Modified* and type `NEW`. Load Listing 3 and remove the `REM` from Line 199 and run. This version uses `LEFT$` to put on the blocks of text with adequate pauses for reading time. There is a discontinuity where the last paragraph, `A$(10)`, is smacked onto the end of `A$(9)`. We are going to straighten out this mess and add `The End!` in an appropriate spot.

List lines 300 to 360. Here is a good example of good-natured CoCo saving me from myself. Look carefully. There are two separate `T` variables due to my carelessness. The `T` in Line 300 belongs to the outer, inclusive loop. The `T` in Line 320 gives CoCo the current value to be used in Line 340 to print the letter at that `T` location in the string `A$(A)`.

Change `T` in lines 300 and 350 to `B` and run. Since the program works, CoCo proves that `T` was really two separate variables with separate functions. They did not impinge upon each other's territory, so CoCo saw no problem. Use `TRON` to study this.

Type `NEW` and load *Modified.* Remove the masking `REM` from Line 199 and run. Oh no! What did we forget? List lines 300 on. Right! Change Line 310, from `10` to `11` and run.

We are going to add a proper ending. List Line 100. Two blank spaces remain at the end of the last row of text. If we skip down three rows, we calculate 32 multiplied by 3 equals 96 spaces. We shall print `The End!`, centered, of course, so that we guesstimate about nine spaces in front of the legend. We shall create `110 A$(12)=STRING$(107,143)+"The End"`.

Line 6 needs to reserve another item in the array. Thus, rekey: `6 DIM A$(12)`. Learning from experience, we increase `A` in Line 310 by one to 12. While we are at it, we might as well as do the same in Line 200, (the other version that we will check out later). Now run this.

We got an OS Error after a while. CoCo is having problems, due to our desire to add an ending. It is crying for more reserved memory to store all those extra blanks. Raise the value in Line 5 to `600` and run. That works! But we better change `107` to `110` in Line 110 and, at the end of it, add `+STRING$(38,143)`. Now run to see what we created.

We created another OS Error. We need to reserve still more memory. In Line 5, change `600` to `700` and run. That's fine! For the acid test, replace the masking `REM` marker in Line 199 and run. That's it! Wrap it up by saving it.

You've learned a lot with hands-on investigation. You had fun exercising your inquiring mind and created two impressive variations of a theme. We didn't use any specific value to locate anything, but used a vague, indistinct system. CoCo used the semicolon to present the text from start to finish.

There is a third variation you may want to try. Using *Modified* with Line 199 unmasked, add `STEP2` to Line 310 and at the end of Line 330 add `:CLS`.

I am sure, with your creative juices flowing, you will find a way to add `The End` to the program. I bet you will also come up with a way to center each panel. No hints except to say that you learned one technique (in bits and pieces) in this tutorial, although you may not have realized it.

What better way to leave you — having fun while being engrossed in working out a problem and adding to your programming skills? ☐

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Listing 1: MAJUNGA

```
0 '<LISTING1> MAJUNGA
5 CLEAR 500:CLS
10 A$(1)="  THIS PROGRAM IS AN E
XPERIMENT TO FIND OUT WHAT THE E
FFECTS AREON THE SONORA SUNFLOWE
RS WHEN   DRENCHED IN A THICK BA
TH OF     GAMMA RAYS.  YOU MAY N
OT BE TOO IMPRESSED BUT HAVE YOU
 NOTICED THE DIFFERENCE BETWEEN
 THE SON- ORA AND HUELGO"
20 A$(2)=" TYPES OF MAJUN-  GA?
 SONORA GROWS ONLY IN THE   LAZA
FUNDIAN SWAMP AND THE HEULGOTYPE
 IS FOUND EXCLUSIVELY ON THENEAR
 SLOPES OF THE SIERRA MADRE MOUN
TAINS."
30 A$(3)="  THE MAJUNGA HAS FIVE
EPICENTRAL UNGLAVES WHILE THE
ANTI-MAJUNGAS HAVE SIX OR SEVEN.
  WHEN THE GAMMA RAY HITS THE
ANTI-MAJUNGA IT CURLS THE PHENO-
ORAL UP AND IT WITHERS IN NO
TIME FLAT."
40 A$(4)="
  IT IS A SORRY STATE OF AFFAIRS
ESPECIALLY, SINCE THE SONORA IS
SO LUSH.  THUS FAR, NO INDUST-
RIAL USES HAVE BEEN FOUND, BUT,
IT IS CONTEMPLATED, WITH THE AD-
VENT OF COMPUTER TECHNOLOGY, MA-
JUNGA WILL BE A FACTOR."
50 A$(5)="               MAJUNGAS, L
IKE JOJOBA NUTS ARETANGY AND WHE
N UNRIPE, A LITTLE ASTRINGENT. I
F THAT COULD BE    CULLED OUT, T
HE MAJUNGA WOULD BEA BOON TO MAN
KIND AND REVOLU-   TIONIZE THE G
RANOLA BAR AS WE   KNOW IT TODAY
!"
200 FOR A=1 TO 5
210 L=LEN(A$(A))
220 FOR B=1 TO L
230 PRINTMID$(A$(A),B,1);
240 FOR T=1TO 20:NEXTT,B,A
250 GOTO 250
```

Listing 2: ROMAN

```
0 '<LISTING2> ROMAN
5 CLEAR500:CLS
10 A$(1)=" THE CHURUSCI WERE A
BRANCH OF THE TUETONII, A GERMAN
IC TRIBE  DWELLING NORTH OF THE
HYRCANIAN FOREST, ALONG THE BANK
S OF THE  ELBE RIVER."
20 A$(2)="
THEY WERE FORCED NORTH BY THE M
ARCOMMANI.  THIS MADE THEM IN- T
RUDE INTO THE TERRITORY OF THE S
WABII, A FIERCE GERMAN TRIBE   T
HAT WAS IN FLUX AT THE TIME."
30 A$(3)="    THE ROMAN TWENTIE
TH LEGION,  UNDER MARCUS AVARIC
US, WAS IN   THEIR WINTER CAMP A
T INCENDUNUM."
40 A$(4)="  THE SWABII, UNDER BA
DUCI, DE- CIDED TO ATTACK THE CA
MP OF THE ROMAN LEGION.  IT WAS
EITHER     THAT OR TURN ON THEIR
GERMANIC  TORMENTORS, THE CHURUS
CI.  THEY OPTED TO ATTACK AT NIG
HT."
50 A$(5)="          THIS WAS A BI
G MISTAKE SINCE  THE SWABIAN CLA
NS WERE LED BY   FIERCE BUT UNDI
SCIPLINED WAR-   RIORS.  THEY MA
DE A BIG NOISE BYSTRIKING THEIR
SPEARS AGAINST   THEIR LEATHER S
HIELDS.  THIS    ONLY ALERTED TH
E LEGIONARIES ANDINFURIATED"
60 A$(6)=" THEM.  AFTER A BRIEF
STRUGGLE, THE SWABII WERE ROUTED
AND THEIR LEADER BADUCI WAS CAP-
TURED AND BOUND AND SENT TO
ROME.  HERMAN, BROTHER OF BADU-
CI, OFFERED TO TAKE BADUCI'S
PLACE, BUT MARCUS AVARICUS, IM-
PRESSED WITH THIS FILIAL"
70 A$(7)=" DEVO-  TION OFFERED T
O MAKE HERMAN    LEADER OF THE
GERMAN AUXILLI-  ARIES.  HERMAN
 ACCEPTED AND    YEARS LATER BE
CAME THE ROMAN   EMPEROR, VALEN
S.  THUS, WAS THE FATE OF ROMAN
DETERMINED."
200 FOR A=1 TO 7
210 FOR B=1 TO LEN(A$(A))
220 PRINTMID$(A$(A),B,1);
230 FOR T=1TO 20:NEXTT,B,A
240 DEL211:GOTO240
```

Listing 3: ANGLO

```
0 '<LISTING3> <ANGLO>
5 CLS:CLEAR500
10 A$(1)="  THE ANGLO-SAXONS WER
E TWO     CLOSELY RELATED GERMAN
IC TRIBES LOCATED IN NORTHERN GE
RMANY FAC-ING THE NORTH SEA."
20 A$(2)=STRING$(14+32,143)
30 A$(3)="  THE JUTES WERE ANOTH
ER GERMAN-IC TRIBE THAT WAS SITU
ATED IN   DENMARK, IN WHAT IS NO
W CALLED  JUTLAND."
```

```
40 A$(4)=STRING$(24+32,143)
50 A$(5)="  AT ABOUT THE SAME TI
ME, IN THELATE FIFTH CENTURY A.D
., DUE TO PRESSURE FROM OTHER GE
RMANIC    TRIBES, THESE SEA-GOIN
G TRIBES  CROSSED OVER INTO SOUT
HERN ENG- LAND."
60 A$(6)=STRING$((27+32),143)
70 A $(7)="  THEY QUICKLY OVERPO
WERED THE  REMNANTS OF ROMAN SET
TLERS AND  THE INDIGENOUS CELTIC
 PEOPLES.  IN A FEW HUNDRED YEAR
S, THE MIX OF GERMANIC TRIBES, R
OMAN COLON-ISTS AND CELTIC INHAB
ITANTS     DEVELOPED INTO THE EN
GLISH RACE."
80 A$(8)=STRING$(32,143)
90 A$(9)="  LATER SEA-GOING DANE
S CROSSED THE NORTH SEA AND SETT
LED IN    COASTAL NORTHERN ENGLA
ND.  STILLLATER, THE NORMANS, FR
ENCH-     SPEAKING DESCENDANTS O
F VIKINGS,TOPPLED THE SAXON NATI
ON IN 1066A.D."
100 A$(10)=" THESE INVADERS BROU
GHT     THEIR LANGUAGE AND CUSTO
MS WITH THEM. THEY WERE SUPERIMP
OSED ON THE SAXON INHABITANTS BU
T, BY   AND LARGE, THE RACE WAS
UN-     CHANGED."
199 'GOTO 299
200 FOR A=1 TO 10
210 FOR B=1 TO LEN(A$(A))
220 PRINTMID$(A$(A),B,1);
230 FOR T=1TO 20:NEXTT,B,A
240 GOTO 240
299 '***
300 FOR T= 0 TO LEN(A$(A))
310 FOR A= 1 TO 10
320 T=LEN(A$(A))
330 FOR Z= 1 TO 3000:NEXT
340 PRINTLEFT$(A$(A),T);
350 NEXTA,T
360 GOTO360
```

Listing 4: MODIFIED

```
0 '<MODIFIED>
5 CLS:CLEAR500
6 DIM A$(11)
10 A$(1)="  THE ANGLO-SAXONS WER
E TWO     CLOSELY RELATED GERMAN
IC TRIBES LOCATED IN NORTHERN GE
RMANY FAC-ING THE NORTH SEA."
20 A$(2)=STRING$(14+32,143)
30 A$(3)="  THE JUTES WERE ANOTH
ER GERMAN-IC TRIBE THAT WAS SITU
ATED IN   DENMARK, IN WHAT IS NO
W CALLED  JUTLAND."
40 A$(4)=STRING$(24+32,143)
50 A$(5)="  AT ABOUT THE SAME TI
ME, IN THELATE FIFTH CENTURY A.D
., DUE TO PRESSURE FROM OTHER GE
RMANIC    TRIBES, THESE SEA-GOIN
G TRIBES  CROSSED OVER INTO SOUT
HERN ENG- LAND."
60 A$(6)=STRING$((27+32),143)
70 A $(7)="  THEY QUICKLY OVERPO
WERED THE  REMNANTS OF ROMAN SET
TLERS AND  THE INDIGENOUS CELTIC
 PEOPLES.  IN A FEW HUNDRED YEAR
S, THE MIX OF GERMANIC TRIBES, R
OMAN COLON-ISTS AND CELTIC INHAB
ITANTS     DEVELOPED INTO THE EN
GLISH RACE."
80 A$(8)=STRING$(32,143)
90 A$(9)="  LATER SEA-GOING DANE
S CROSSED THE NORTH SEA AND SETT
LED IN    COASTAL NORTHERN ENGLA
ND.  STILLLATER, THE NORMANS, FR
ENCH-     SPEAKING DESCENDANTS O
F VIKINGS,TOPPLED THE SAXON NATI
ON IN 1066A.D."
95 A$(10)=STRING$(28+32,143)
100 A$(11)="  THESE INVADERS BRO
UGHT THEIR  LANGUAGE AND CUSTOMS
 WITH THEM. THEY WERE SUPERIMPOS
ED ON THE   SAXON INHABITANTS BU
T, BY AND   LARGE, THE RACE WAS
UNCHANGED."
199 'GOTO 299
200 FOR A=1 TO 11
210 FOR B=1 TO LEN(A$(A))
220 PRINTMID$(A$(A),B,1);
230 FOR T=1TO 20:NEXTT,B,A
240 GOTO 240
299 '***
300 FOR T= 0 TO LEN(A$(A))
310 FOR A= 1 TO 10
320 T=LEN(A$(A))
330 FOR Z= 1 TO 3000:NEXT
340 PRINTLEFT$(A$(A),T);
350 NEXTA,T
360 GOTO360
```

Viewing PMODE 4 Pictures on Your CoCo 3

By Marty Goodman
Rainbow Contributing Editor

- *When I view* `PMODE 4` *pictures on my CoCo 3 using my (Tandy) CM-8 monitor, there are no colors. Why is this?*

Noel Fallon
(FALLON)
Lawton, OK

The colors you are accustomed to seeing in `PMODE 4` pictures using a color TV or composite color monitor are what we call "artifact colors." They are an "artifact" of some idiosyncrasies of the composite video signal protocol. When you switch over to using the RGB signal protocol, those colors are lost. What is gained by the RGB protocol is the potential to display more colors, more precisely, in higher resolution. But we will have to wait for the arrival of quality Hi-Res graphics editor programs to make use of that capability on the CoCo 3. Please see my answer to the next question for more hints on viewing old `PMODE 4` CoCo pictures on your CoCo 3.

- *What monitor do you recommend for the CoCo 3?*

Rick Adams
(RICKADAMS)
Rohnert Park, CA

While the CM-8 is made for the CoCo 3, I recommend that folks buying a monitor for their CoCo 3 also consider models that can accept both RGB A and color composite video inputs. Using such a monitor, you can switch at will to composite video, and see your old `PMODE 4` pictures in full color. Note that these monitors also have an RGB I (TTL) input, so they can be used with IBM PC (or Tandy 1000) RGB CGA outputs also. Two such monitors are the 8CM8505 and the 8CM8515 from Magnavox, but a special cable to go between the CoCo 3 and the Magnavox monitors will be needed. Other monitors with a variety of color inputs that can be made to work with the CoCo 3 in both RGB A and composite video mode include the Sony 11CR series and the Teknika MJ305. Sony's 11CR series requires that you use the composite video from the CoCo 3 to supply its sync line, for it demands a combined sync signal, instead of the separate H and V sync supplied by the CoCo 3, and used by some monitors. Note that unlike Tandy's CM-8, all of the monitors mentioned can also be used with VCRs.

- *I just bought a Drive B for a Tandy 1000 and installed it in my CoCo FD 500 case. It works fine as Drive 1, but I'd like to know how to use both sides of it under OS-9.*

Bruce E. Ondersma
(BEO)
Grand Rapids, MI

There are several ways to use double-sided drives under OS-9. On Delphi, we have posted patches to the existing CC-Disk drivers that will allow this. Alternatively, you might want to buy one of the commercial packages that allows you to configure your OS-9 drivers for one or two sides. Computerware and D.P. Johnson both make such packages. The Computerware package (*Disk Fix and other Utils*) is particularly nice in that it includes some other useful OS-9 tools. The Computerware product does not, however, support 80-track drives.

- *Can I use* Colorcom/E *with my Volksmodem 12?*

Steve Short
Jackson, TN

Yes, you should be able to use *Colorcom/E* with your Volksmodem. The proper cable is needed and you may have to set appropriate switches on the modem. A careful study of the modem and its manual will be needed, as each modem requires slightly different tinkering with its setup and pinouts. In general, set any switches so that DTR (date terminal ready) is true always. Disable the auto-answer. Wire up a four-pin DIN to a 25-pin DB connector for your CoCo as follows: Pin 4 of the CoCo DIN connector goes to Pin 2 of the modem DB-25 connector, Pin 2 of the CoCo DIN goes to Pin 3 of the modem DB connector, Pin 3 of the CoCo DIN goes to Pin 7 of the modem DB connector, and Pin 1 of the CoCo DIN connector goes to Pin 8 of the modem DB connector. The required four-pin DIN connector, 25-pin DB connector, and necessary hoods and wire for this cable can all be purchased at Radio Shack. Note that there are some patches for *Colorcom/E* on Delphi that fix some bugs in it, de-protect it, and make it CoCo 3 compatible. Look for these in the Data Communications database, where they were posted by Art Flexser.

- *I am tired of the small viewing area and black border that surround my*

Martin H. Goodman, M.D., a physician trained in anesthesiology, is a longtime electronics tinkerer and outspoken commentator — sort of the Howard Cosell of the CoCo world. Marty is the database manager of RAINBOW's CoCo SIG on Delphi. His noncomputer passions include running, mountaineering and outdoor photography. Marty lives in San Pablo, California.

CoCo's 32-column green screen. Why did Tandy do this, and what can be done to fix it?

Richard Hill
Owensboro, KY

The characteristic of that screen that you complain of was established not by Tandy, but rather by Motorola in the design of the 6847 VDG video chip used in the CoCo 1 and 2. The reason they limited the display to the center of the screen was that many different models of TV sets had different amounts of "overscan," and they wanted to make the display sufficiently small so it would never be cut off due to the particular adjustment of a given TV set. Because it is fixed inside the hardware of the VDG chip, there is no easy way to alter this. You have two routes to using more of the screen:

1) Purchase a PBJ Word-Pak along with a multipack interface and a monochrome monitor and software that uses the pack, and you will have 80-column text capabilty under OS-9 and under a few Disk Extended BASIC programs.

2) Purchase a CoCo 3 and either a monochrome ($60 to $100) or an RGB color ($270 to $450) monitor. The CoCo 3 has both text and graphics video modes that use the screen edge to edge. But watch out! In its 40- and 80-column text mode, the CoCo 3's screen often is not visible in its first and last two or three columns, due to overscan on some commercial television sets and on some commercial color composite video monitors. This is the kind of problem that Motorola sought to avoid in its design of the old VDG chip. The wider display of the CoCo 3 will always be properly displayed on monochrome and RGB A monitors.

Note that a TV service technician can adjust some TVs and many monitors for a narrower display and thus fit in the full CoCo 3 screen. This sometimes merely involves turning a slug in a coil inside the monitor, though at times it involves an actual patch to the horizontal oscillator circuit.

• *I am designing a board to plug in to the CoCo 2B, on which I plan to put a 2764 EPROM and a few small to medium scale TTL chips. Will the CoCo be able to supply enough power for such a board?*

Steve Allen
(STEVEALLEN)

All of the power supplies for the CoCo 1 and 2 have been on the marginal side in terms of power to spare. However, all of them have been able to power a disk controller, which has both an EPROM and a number of other chips on it. I suspect that the CoCo will quite adequately power a board of the sort you describe. Since I am conservative when it comes to hardware design, I'd recommend you use a 27C64 (CMOS) EPROM and 74C, 74HC, or 74HCT series chips, all of which are CMOS (complementary metal-oxide semiconductor) and so consume much less power. The cost of the CMOS EPROM and 74 series chips is not much greater than that of NMOS (N-channel metal-oxide semiconductor) EPROMs and 74LS series logic chips. Given the marginal power capabilities of the CoCo, it might make the difference between the CoCo running too hot or acceptably warm.

Interestingly, the CoCo 3 appears to use the same power supply as that used in the CoCo 2. Now, the CoCo 3 circuit appears to draw less power than a CoCo 2 circuit. The GIME chip, which replaces both the power hog TTL SAM (transistor-transistor logic synchronous address multiplexer) chip and the VDG (video display generator) chip, is a low power CMOS chip. I would predict from this that the CoCo 3 will run cooler than its predecessors, with more power to spare for driving devices plugged into its port. Note also that the CoCo 3 has its eight data lines on its bus buffered with a 74LS245 chip. Though the address lines on its port are still unbuffered.

• *Recently when I plugged my disk interface cartridge into my CoCo I saw sparks flying out of the interface. My system was fried. Most of the damage came from pins 36 and 43 (sic) of the cartridge port. My drives may be good, but I don't know where to get a separate disk controller pack without the drives. Also, can I possibly use some of my old chips (RAMs) from my fried CoCo to upgrade a new one?*

Lee Killough
Conroe, TX

Before you do anything else you need to find out why you fried your CoCo, or else you risk frying the next CoCo you hook up! Your information was garbled (there is no "Pin 43" on the cartridge connector — that connector has only 40 pins). But it sounds as if you got high voltage (probably 120 volts AC) on your *ground* lines. This could happen from improperly grounded disk drives that had a fault inside the case. Or the fault might be inside your CoCo itself. This could be the case even though you had the switches off on both the CoCo and the disk drives. Such a fault not only will roast CoCos, but can also constitute a lethal shock hazard. You need to take your drives in to a service center and have them checked out. Same for the rest of your system.

Given the sort of problem you describe, it is quite possible you burned out every chip in your CoCo, so none of them may be usable. You'll need to experiment by trying the chips out in another machine.

Disk controller cartridges can be purchased through any of a dozen or more sources that advertise in RAINBOW. Look through this or any issue for details. Among the many companies that sell them are DISTO (CRC), J&M systems, HDS, True Data Products, and Spectrum Projects. Check the advertisers index in RAINBOW. The price is often in the $70 to $100 range for a given unit.

Sorry to hear you smoked your CoCo. But I'm glad you are alive to tell the tale.

Your technical questions are welcomed. Please address them to CoCo Consultations, THE RAINBOW, P.O. Box 385, Prospect, KY 40059.

We reserve the right to publish only questions of general interest and to edit for brevity and clarity. Due to the large volume of mail we receive, we are unable to answer letters individually.

For quicker response time, your questions may also be posted in the FORUM section of RAINBOW's CoCo SIG on Delphi. In FORUM, type ADD and address your questions to the username MARTYGOODMAN. Marty is on most every evening to respond to FORUM messages. Other CoCo SIG members may also reply to questions posted in this public message area. Please be sure to leave your name and address in any FORUM questions, since those of wide interest will be selected for publication in this column.

TURN OF THE SCREW

Taking a Look at How Monitors Work

By Tony DiStefano
Rainbow Contributing Editor

Well, I finally got my CoCo 3. The first thing I needed to do was to plug it into a monitor. In my computer room I have various color monitors, TVs and monochrome monitors. I read through the CoCo 3 manual and found out it has three ways of connecting a display to it. The first and most common is the RF output. This is where you connect an ordinary TV to it. The second is a composite color output, sometimes known as a video output. The third is an RGB output.

Now, most people are familiar with the RF output. Many people know about video outputs, but what is this RGB stuff? It is not new to me because I use an RGB monitor for my other computers. With the right connector, a piece of ribbon wire and the right information, I connected the CoCo 3 to my Sony RGB monitor.

Ever since I wrote an article on how to connect your CoCo to a monochrome monitor, I have been getting calls about it. So, with the coming of the CoCo 3, it is time to do an "everything you ever wanted to know about monitors but were afraid to ask" article. Here it is.

I am going to start from the basics and work my way up to RGB. Let's begin with some theory on a monochrome monitor. The mono part of that word implies one color. At first, all picture tubes were white. Then green was the "in" color and then amber became popular. Whatever the actual color of the tube, it is still one color, hence monochrome. A picture tube is made of glass. Inside this tube is a vacuum. On the inside surface of the display area there is a thin coating of phosphorus. One physical property of phosphorus is that when bombarded with electrons (high voltage electricity) it glows. Inside the back end (neck) of a picture tube there are circuits that shoot electrons at the phosphorus. The construction of the tube is beyond this article, but when it is on, a stream of electrons hits the phosphorus, and where it hits, the phosphorus glows. But alone, all that does is make a glowing dot in the center of the screen. Not much good.

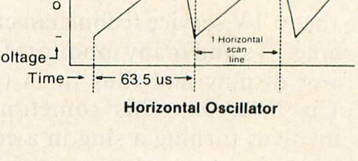
Since electrons are affected by a magnetic field, putting a magnet close to the tube will deflect our dot. The dot would move according to the strength and direction of our magnetic field. An electric current through a wire creates a magnetic field. The more current, the stronger the magnetic field. A length of wire wrapped in a coil is enough to deflect our dot anywhere on the screen. In most monitors, two coils of wire wrapped around the neck of the tube are used to move our dot around. One coil is positioned so that a varying amount of current makes the dot move sideways or horizontally. The other is positioned to give up/down or vertical motion.

Given the right amount of current and in the proper sequence, our dot now moves from right to left and from top to bottom, in the same motion as reading. Make that dot move fast enough and it appears to fill the screen with light, since phosphorus continues to glow for a short time after the dot has moved. Those lines you see on your screen are made by one moving dot.

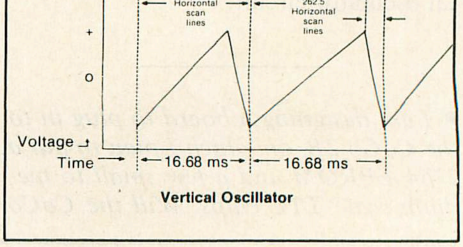
So far, we have one moving dot that fills the screen with light. If, while moving this dot, you were to increase and decrease the number of electrons hitting the phosphorus, you would get varying amounts of light. The amount of light produced is directly proportional to the number of electrons hitting the phosphorus.

Things are shaping up to a picture. In a TV monitor, there are many signals and currents, one of which is called the horizontal oscillator. This circuit is connected to the coil that deflects the dot horizontally. Figure 1 shows the wave shape of the horizontal oscillator. It starts off negatively, deflecting the dot to the left. It increases linearly to a positive position, moving the dot smoothly across the screen. Then, it

Figure 1



Horizontal Oscillator



Vertical Oscillator

Tony DiStefano is a well-known early specialist in computer hardware projects. He lives in Laval Ouest, Quebec.

quickly jumps back to the original position. During this time the electron flow is cut off so that it will not appear on the screen. This time period is known as the retrace time, and the circuit that cuts off the electron flow is called a blanking circuit.

Another circuit in a TV is the vertical oscillator and yes, you guessed it, it controls the dot vertically. The wave shape of the vertical oscillator is basically the same as the horizontal one, only much slower. Many horizontal cycles fit inside one vertical cycle (more on this later). The vertical oscillator also has retrace time and vertical blanking circuits. Due to its nature, one horizontal cycle is called a scan line, and one vertical cycle is called a frame.

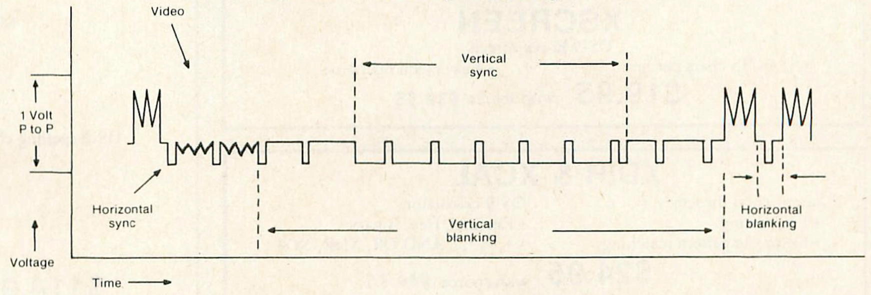
When our dot is not doing horizontal retrace or vertical retrace it appears on the screen. This is known as active video. It is during this time that our dot gives the viewer useful information. This information can be a picture like ordinary TV, or computer generated characters. In either case, the video signal is proportional to the brightness of the picture. A higher signal produces a brighter dot and a lower signal produces a softer dot.

In order for a picture to appear on a video monitor, three signals are needed; horizontal, vertical and video signals. It is not efficient to run three signals and a ground return to a TV receiver or monitor. A method was developed to combine these three signals into one. Instead of supplying complete horizontal and vertical wave shapes, the source need only send a pulse signifying the start of every horizontal line and the start of every vertical frame. These pulses are known as sync pulses. The rest of the wave shape is then regenerated inside the monitor. It is then up to the monitor to make sure that the internal horizontal and vertical oscillators keep up with the sync pulses.

These sync pulses and video signals are mixed together in a specific way to form one signal called "composite video," for obvious reasons. Figure 2 shows part of a composite signal. In North America, all composite video conforms to the NTSC (National Television Systems Committee) standard; more on that later. In a monitor, circuits are made to separate the video information from the sync signals, and are then translated to drive currents that connect to the coils and the picture tube.

Up till now, I've been talking about monochrome (black and white) pictures. But, there is a good reason why Tandy calls our CoCo a Color Computer — it can display a color picture. When TV first came out, it was only in

Figure 2: A Composite Signal



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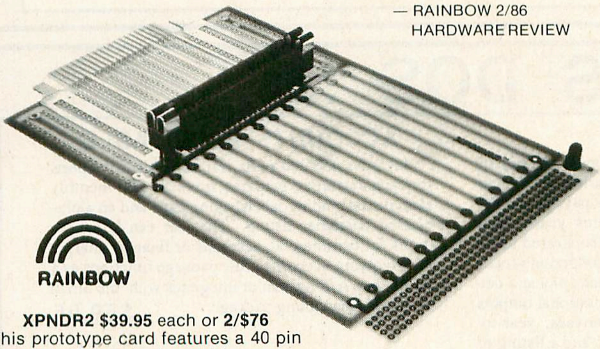

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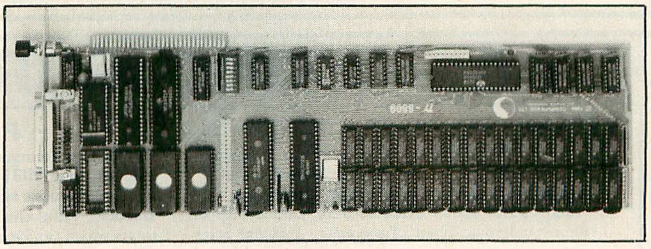

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black and white. When color came out, a method had to be developed so that a color signal would be compatible with a black and white TV.

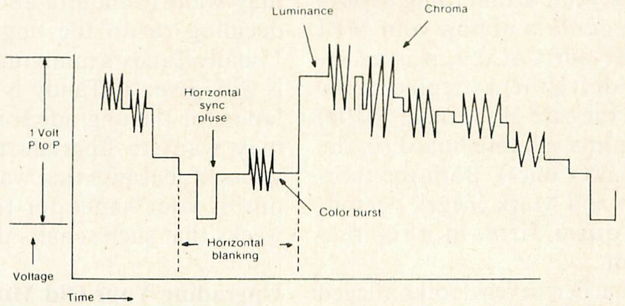
It was up to the NTSC to develop a composite signal that would carry the extra color signal and still be compatible with the older black and white signal. In 1953, the NTSC established the color television standards. In these standards, the signal is to have 525 line interlaced scan. The horizontal scan frequency is 15.734 kHz; the vertical frequency is 59.94 Hz. The color information is contained in a 3.579545 MHz subcarrier. The phase angle of the subcarrier represents the color, and the amplitude of the carrier represents the saturation. Figure 3 shows one horizontal line. Notice the color frequency burst just after the horizontal sync. The phase difference between this reference burst and the actual signal describes what color that particular part of the screen should be. The amplitude of the color signal represents how much of that color to put on the screen.

On the monitor side, color is quite complicated to reproduce. You have to start with a completely new tube. Instead of smooth monochrome phosphorus, the tube has to be striped with alternate red, green and blue phosphorus. The smaller the stripe the better the picture quality.

When a color composite video signal enters a color monitor, it is first stripped of its sync signals, and then the monochrome (called luminance) and color signals (called chroma) are split into three signals, the red content, the green content and the blue content. Three separate electron beams are used to display the three colors on the screen. The beam carrying the red content has to hit all the red strips. The green hits the green strips and so on. If a beam that has red information hits any other color than red, a wrong color results. It requires a lot of electronic circuits to keep this from happening. That is not the worst part; the color frequency carrier is 3.58 MHz. In order to isolate the color carrier from the monochrome signal, a filter is used that removes any frequency higher than 3.58 MHz. This seriously limits the resolution of a color signal. In fact, the resolution of a color signal, at absolute best, is about 400 lines. That is OK for the CoCo and CoCo 2 but is not good enough for the CoCo 3.

When you put a color signal in a monochrome monitor, the color information shows up as dots on the screen. Figure 3 shows that. The frequency of the color signal is 3.58 MHz. A monochrome monitor with a 20-MHz bandwidth has no filter to remove the color carrier. The monitor will have no problems displaying the color carrier — as an annoying monochrome mess of dots.

Figure 3: One Horizontal Line



Now comes the CoCo 3. It has a resolution of 640-by-192. That is very nice but have you ever seen a 640-by-192 screen on a regular composite monitor? Believe me, it's not a pretty sight. What is Tandy to do? The only reasonable thing is to get rid of that color carrier and put out the color information separately. Now that is a great idea and for once Tandy did it right! The CoCo 3 has an output known as an RGB output. That's right, RGB stands for Red, Green and Blue. No color carrier, no filters and no sync pulses, just clean color.

Wait a minute, that won't work without sync pulses. So Tandy added some more lines and added sync pulses. In fact, the CoCo 3's RGB output is the best color picture ever for a CoCo! The clarity is limited only by the resolution of the monitor.

You don't have to have a Tandy RGB monitor. However, if you plan on going out to buy a brand X monitor at some discount mail order house, here are a few tips to help you get started with fewer headaches.

First, when you select a model you want (or can afford), make sure that it is an RGB analog monitor with negative or composite sync (like my Sony) with a horizontal frequency of 15.7 kHz and a vertical frequency of 60 Hz. Also make sure that the bare connector to the monitor is available. You will also need a connector for the CoCo 3 side of it. That requires a 10-pin female socket connector for flat ribbon cable. And don't forget to get three or four feet of 10-conductor flat ribbon cable. Use the pinout supplied in the CoCo 3 manual and match the pinout of the RGB monitor manual to it. Now plug it in and watch it go!

***
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What you need to know to upgrade your Multi-Pak Interface for use with your new CoCo 3

A PAL for Your CoCo 3

By Marty Goodman

Reference has been made to the fact that you will need to upgrade your Multi-Pak Interface if you want to use it with your new CoCo 3. There has been a lot of confusion about this. In this article, I hope to clarify matters regarding this upgrade, explaining why it is necessary, how to do it, and where and how to get the needed parts. Much of my information for this article comes from *Tandy Technical Bulletin CC:29*, dated August 14, 1986. This bulletin is distributed to Tandy Computer Service Centers. Some of it comes from personal tests, and some from personal communication with Mark Siegel of Tandy Corporation.

There are two different types of Multi-Pak Interfaces (MPI) for the CoCo. The "old MPI" was the first MPI sold by Tandy. It is physically larger than the newer ones, and is Radio Shack Catalog No. 26-3024. This model was first sold with a battleship gray case, though later it was sold with a white case.

Later on, Tandy redesigned the MPI, making it smaller and much less expensive to produce. This newer, slimmer, trimer MPI is Radio Shack Catalog No. 26-3124. The catalog number can be found on a sticker on the bottom of your Multi-Pak.

When folks first got their CoCo 3s, brought them home, and plugged them into their old Multi-Paks (with the disk controller plugged into Slot 4 as recommended by Tandy), they discovered one of three things. Some found that their MPIs appeared to work perfectly. Others found that their disk controller would be recognized by the CoCo 3 only if it was plugged into Slot 1. Still others found that regardless of what slot they plugged their disk controller into, it simply would not be seen by the CoCo 3. This different behavior is explained by the fact that different releases of the same catalog number MPI had slightly differently programmed PAL chips in them.

The critically important thing to note here is that *regardless* of how your MPI behaves with your CoCo 3, it is *necessary* to upgrade it either by replacing the PAL chip (in the case of the older MPIs) or by adding in a satellite board (in the case of the newer ones). Both the technical bulletin and Mark Siegel, personally, were quite firm in this recommendation.

Note that earlier, several folks alleged that this upgrade was needed only if you were going to install 512K in your CoCo 3. That is false. You need to do this upgrade regardless of the amount of memory in your CoCo 3.

At the Princeton RAINBOWfest, I heard that all local Radio Shack retail outlets had been briefed in the problem with the Multi-Pak. However, I called five Radio Shack Computer Centers in the San Francisco Bay area, and five Radio Shack stores with computer divisions. No one had heard of this problem. Because of this, I urge you, the RAINBOW reader, to tell *your* local Computer Center or division personnel about this problem.

By informing the local stores, you may save other CoCo 3 purchasers some grief. You might even consider urging your local Radio Shack store employee to buy a copy of this issue of RAINBOW for reference on this matter.

If your Multi-Pak is still under warranty (if it has been less than 90 days since it was bought or last repaired) I have been told by Mike Ward that you can get it upgraded for free. Please check out this possibility if your MPI falls into that category. I do not know how much, if anything, Tandy ordinarily charges for labor on upgrading the Multi-Pak. The parts fee is $7.50. You may want to inquire about this before deciding to do the upgrade yourself. Usually Tandy's minimum labor charge is $15. Even if Tandy is providing the labor for the upgrade for free, you still may want to upgrade the Multi-Pak yourself, because that way it will not be out of your hands for the one to two weeks that such repairs often take.

Upgrading Your Old Multi-Pak

If you own one of the older MPIs (Catalog No. 26-3024) it will be relatively easy for you to do the upgrade yourself. All you need is a 20-pin PAL chip. To order it, just go to your local Radio Shack store and tell them you want to order, from National Parts, Part Number AXX 7123, and also tell them that that part is for Catalog No. 26-3024. It should cost $7.50. It usually takes about two weeks for the part to arrive at your local Radio Shack store.

Be sure the MPI is unplugged, then open the case of your old Multi-Pak. This, of course, will involve breaking the warranty sticker that covers one of the four screws.

Martin H. Goodman, M.D., is a longtime electronics tinkerer and lives in San Pablo, California. Marty is a RAINBOW contributing editor and writes the "CoCo Consultations" column. He is also the database manager of RAINBOW's CoCo SIG on Delphi.

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Saturday
  — CoCo Community Breakfast at 8 a.m.
  — Exhibits open at 10 a.m. and close at 6 p.m.
Sunday
  — Exhibits open from 11 a.m. to 4 p.m.

Remove the black cardboard shield that covers the space around the four card sockets. You will now see the circuit board. Note that only one chip on that board is socketed. All others are soldered directly to the board. The chip you are interested in is the socketed one, a 20-pin chip called U8. Carefully remove this chip and replace it with the new chip you just bought. In doing this you must be careful not to bend pins on the new chip, and you must be careful to put in the new chip with its notch pointing the same way as the notch on the chip you just removed. Also, observe the usual anti-static precautions for handling delicate chips. The new chip will come to you on a piece of black anti-static foam. Place the old chip that you removed into this foam, and save it in a safe place. I will explain why later.

After successfully replacing the old PAL chip, put your MPI back together again and the upgrade is complete. Be careful about positioning the plastic extension of the slot select switch as you are reassembling the Multi-Pak.

Upgrading Your New Multi-Pak

If you own one of the newer MPIs (Catalog No. 26-3124), I recommend you take your MPI to Tandy and have them upgrade it for you. This is because the upgrade involves cutting a trace on the circuit board, and then delicately soldering seven wires of that satellite board to various integrated circuit chip pins on the board. If you feel totally comfortable with doing such work, what follows is a brief outline of the upgrade process.

Go to your local Radio Shack and order from National Parts a Satellite Board, Part No. AXX 7119 (for Catalog No. 26-3124). This should also cost $7.50.

When you get the satellite board, open up your MPI, being careful to note the length of the screws that hold it together and what holes they go in. Be sure, that your MPI is unplugged. Now:

1) Unscrew and free the printed circuit board. This involves removing three screws that hold it down, removing all metal clips that hold the shield to it, and removing the shield itself. Carefully note the position of the metal clips for reassembly. You need not disconnect the transformer.

2) Locate IC6, the monster 64-pin chip. Cut the trace that connects Pin 52 of IC6 to Pin 19 of IC1 (the 74LS245 chip used to buffer the data lines).

3) Position the satellite board over IC 6, with its components up, and with its wires facing the card edge.

4) Locate IC4. This is one of three 74LS367 buffer chips. Solder the three yellow wires from the satellite board to pins 3, 9, and 11 of IC4. It does not matter which yellow wire goes to which of the three pins on IC4.

5) Solder the white wire from the satellite board to Pin 52 of IC6 (the big IC).

6) Solder the blue wire from the satellite board to Pin 19 of IC1 (the 74LS245).

7) The remaining red and black wires from the satellite board need to be hooked up to +5 volts and ground, respectively. This can be gotten from the power supply pins of any of the chips on the board. Tandy recommends using pins 16 and 8 of IC5, respectively. (Red wire to Pin 16 of IC5 and black wire to Pin 8 of IC5.)

8) Replace the shield on the circuit board. Using two of the three screws that held it to the case, reattach it. The

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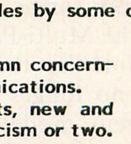

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screws to use are the one near the power *switch and* the one near the selector switch. Now close up the case, being careful to make the extension of the selector switch fit properly.

Problems You Must Know About

After you have completed either of these upgrades (or had Tandy do them for you), the Multi-Pak will now work fine with your CoCo 3 with nearly all Tandy hardware and software. *But*, the fix causes some serious problems with some third-party products. After upgrading your Multi-Pak, it will *not* work with the *CoCo Max* Hi-Res joystick interface. Even if you use that upgraded Multi-Pak with an old CoCo 1 or 2 (the *CoCo Max* software itself will not run on the CoCo 3), the *CoCo Max* hardware card will cease to work. The PBJ Word-Pak I and II will also cease to work with Multi-Paks that have been upgraded for the CoCo 3. The Microworks DS-69A digitizer will also not work with upgraded Multi-Paks.

The reason for this is that the upgrade locks out address space $FF80 through $FF9F. The upgraded Multi-Pak can no longer access those addresses. This lockout is done because the GIME chip in the CoCo 3 uses those addresses, and the upgrade makes sure that no other device will affect those locations. The third-party devices I just mentioned all use port addresses in the $FF90 to $FF9F range, and thus are locked out by the Multi-Pak upgrade.

Note that the PBJ Word-Pak I and II are no longer in production, and the current model (PBJ's Word-Pak RS) uses ports at $FF76, 7, 8, and 9. Thus, it is not affected by the Multi-Pak upgrade. I have spoken with Bob Lentz of Microworks, and he is in the process of fixing his DS-69A digitizer to work on the CoCo 3. At present, I have no word on whether or not a fix for *CoCo Max* will be available.

A Possible Solution for Hackers

If you own one Multi-Pak and occasionally want to use it with a CoCo 2 with some of the hardware that is now locked out, there are a few approaches to fixing this problem. In all cases you need to be a little bit of a tinkerer.

If you have a new, small MPI (Catalog No. 26-3124) the fix is quite easy. Open the Multi-Pak and remove the circuit board and shield. Remove the white and blue wires of the satellite board from where they are soldered to the ICs on the main board. Now, send wires from Pin 52 of IC6 and Pin 19 of IC1 to the two poles of a DPDT switch. On one of the two positions, short the two connections together. On the other, hook up the blue and white wire from the satellite board. Refer to my description of the upgrade of the new Multi-Pak to clarify just what wires go where. In effect, what you are doing is switching the satellite board in and out of the circuit. Mount the DPDT switch on the case of the Multi-Pak. You now have a Multi-Pak that can be switched between CoCo 2 and CoCo 3 modes. In CoCo 2 mode, it will work with a CoCo 2 and any of the add-on, third-party hardware I mentioned above. In CoCo 3 mode, it will work properly with a CoCo 3.

If you own one of the older Multi-Paks (Catalog No. 26-3024) you might consider rigging up a "PAL switcher." This switcher is easier to build than you might think, because most of the pins on the PAL chip are either power or inputs. Indeed, only pins 14, 15, 16, and 18 are outputs. Armed with this knowledge, you can piggyback or wire in parallel all but those four pins, then switch them using a 4PDT switch.

Ghost Busting

The reason for the Multi-Pak fix for the CoCo 3 is at least twofold.

First, the older PAL chips used to decode the software slot select port for the Multi-Pak "ghosted" from $FF7F to $FF9F. That is, when a value was written to $FF7F, it appeared at $FF9F also, and vice versa. This ghosting caused no problems with the CoCo 2, but it plays havoc with the CoCo 3, which occasionally wants to write to $FF9F when talking to its GIME chip. Similarly, any attempt at slot selection with a ghosting Multi-Pak will send spurious data to the GIME chip. Thus, the decoding of the software slot selection port had to be made more complete.

Second, Tandy felt it necessary to lock out the $FF80 through $FF9F range ($FFA0 and up are already locked out by the programming of the old Multi-Pak PAL chips). This was to protect the GIME chip from conflicts with information from other external devices that might be addressed in that range.

I have been asked many times already why one should upgrade one's existing Multi-Pak if it happens to be one that appears to work fine with the CoCo 3. I can't fully answer that question at this time. I must emphasize, however, that both the Tandy technical bulletin and top Tandy officials strongly insist that regardless of whether or not your Multi-Pak *appears* to work properly with your CoCo 3, you must get it upgraded to assure proper operation.

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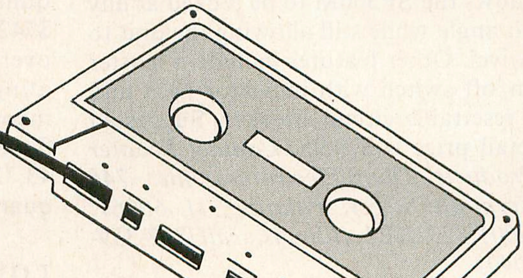

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January 1985 — *It Is Better To PUT Than To GET*, how to use complementary commands to create graphics; *Home Sweet Home*, a graphics program featuring the sights of home life; *The Keyboard Cassette Editing System*, a tape utility that works on BASIC or Extended BASIC to simplify tape commands; *Link*, a utility that concatenates RAM records and writes them to tape; *DISKTEST*, a utility that will check your disk for errors; *A Simple Test Processor*, an easy, efficient text handler; *The Interplanetary Fruit Fly*, a game that demonstrates psuedo high resolution graphics on a text screen. Plus 11 additional programs.

PIPELINE

TWISTER Ohm/Electronics recently introduced their Scooter Model SP500M monitor stand, the newest member of the Scooter line of Guard-It Control Centers. With electrical power protection built into the base, the new control center features a locking tilt and full swivel capabilities. The SP500M provides five protected and switchable sockets. The tilt feature allows the SP500M to be locked at any tilt angle while still allowing the unit to swivel. Other features include a master on/off switch with indicator light and a resettable circuit breaker. Suggested retail price is $79.95. *Contact Scooter Products, Ohm/Electronics, Inc., 746 Vermont Street, Palatine, IL 60067, (800) 323-2727 (Illinois, call 312-359-6040).*

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IDENTITY CRISIS MatheGraphics Software has announced *Trig Identity Graphs* for the CoCo. *Trig Identity Graphs* brings a visual dimension to the subject of trig identities in trigonometry. With this high resolution graphics program, the user can explore the geometric relationships between the two sides of any trig identity and be able to see clearly whether a supposed identity is really valid. *Trig Identity Graphs* is available individually on tape or disk for the Color Computer 1, 2 or 3 with Extended BASIC for $25, or as part of the *Trig Graphs Package* from MatheGraphics. The *Trig Graphs* package also contains *SIN&COS Graphs* and is priced at $40. *Contact MatheGraphics Software, 61 Cedar Road, E. Northport, NY 11731, (516) 368-3781.*

HIGH FINANCE Tandy Corporation has announced that consolidated sales and operating revenues for the first quarter of its 1987 fiscal year were $742,550,000, an increase of 14 percent over the previous year's sales and operating revenues of $650,834,000. Net income for the three months ending September 30, 1986, rose 5 percent to 43,720,000 from 41,713,000 in the same quarter of the prior year.

COVER UP? The Cover Craft line of dust covers from Amherst International Corporation has been expanded to include 50 new models. All covers are anti-static, made with fold stitching and are guaranteed for the life of the hardware. Among the new additions to the line are covers for Okidata, Epson, Citizen and Panasonic printers in versions which include tractor feed, cut sheet feed or just plain. Covers retail for $9.95 to $16.95. *Contact Amherst International Corporation, 540 North Commercial Street, Manchester, NH 03101, (800) 547-5600.*

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MICROWARE SPEAKS The following is taken from the a recent Microware Systems Corporation press release:

> The Color Computer 3 combines an economical, high-performance system with an end-user oriented interface. At the nucleus of the machine is an enhanced version of OS-9 Level II, providing upward compatibility from the Color Computer 2 which uses OS-9 Level I. OS-9 is a real-time, multi-user, multi-tasking operating system that is compact, ROMable and provides a UNIX-style applications environment. The Color Computer version of OS-9 Level II includes a multi-screen, multi-window environment that allows several programs to run simultaneously within different windows. It also has over 30 utility command programs for system and disk file control. OS-9 is available from Tandy for both the 128K and 512K versions of the Color Computer 3.
>
> *Multi-View* is an enhanced windowing environment designed specifically for the Color Computer 3. It gives a common, graphics-based, user-friendly environment for application programs to run under. It consists of systems support for title bars, menu bars, pull down menus and dialog boxes. The graphics shell allows the user, with the aid of a mouse, to select picture oriented commands to process programs and create windows. Standard desk top utilities include: Calculator, Calendar/Memo Book, Alarm Clock, Printer Configuration, Help, Control Panel and Clipboarding Support.
>
> The Color Computer 3's version of Color BASIC, compatible with previous 64K Extended Color BASIC, has been enhanced by Microware for greater control of its new power and capabilities. Commands added to the system allow access to all 512K of memory and high resolution graphics. High resolution text and graphics screens are outside the BASIC workspace and do not use up program memory space.
>
> A *Development Pak*, designed to provide advanced utilities for program development, has also been released by Tandy. Features of the *Development Pak* include: a relocatable macro assembler and linker, hard disk driver, RAM disk driver, descriptors, system programmer utilities, programming support for utilizing the window environment, plus a screen editor.

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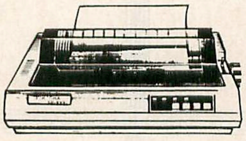

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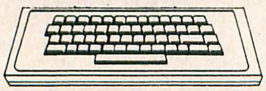

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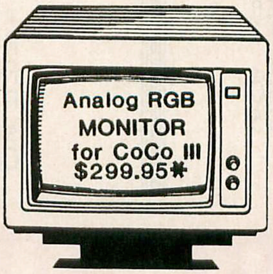

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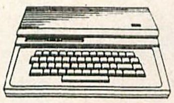

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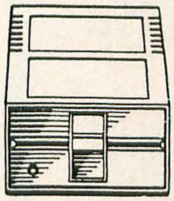

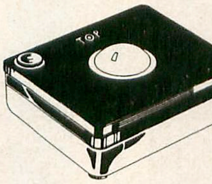

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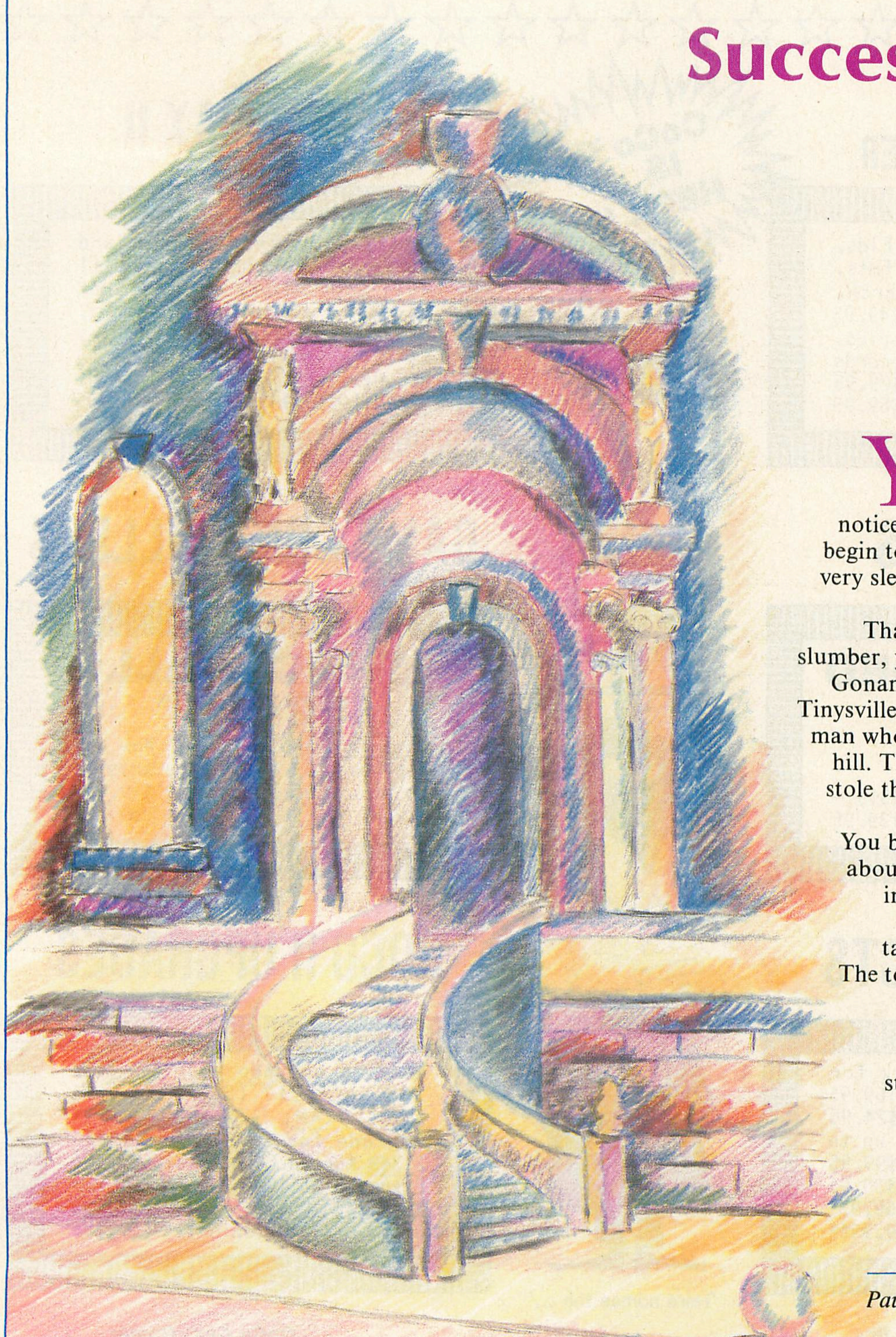
Success Mansion

By Paul Ruby, Jr.



You are lying in bed one evening. As you lie there, you glance over at the clock on the dresser and notice that it is after midnight. Your eyes begin to feel heavy. You are getting sleepy, very sleepy. You can hardly keep your eyes open. ZZZZZzzzzzz . . .

That's it! You're sound asleep. In your slumber, you begin to dream. You are Joe I. Gonamakit. You live in the small town of Tinysville. You have heard rumors of the old man who used to live in the mansion on the hill. The gossip in town says that he once stole the 13 scrolls of success from a guru in India.

You begin to talk in your sleep. You talk about going in the mansion and retrieving the 13 scrolls. Before you realize it, someone has overheard your talk. The rumor spreads like wildfire. The townspeople begin to laugh and talk behind your back.

The dream drags on; months seem to pass. You are still the laughing stock of the town. As you are washing pots and pans in the local restaurant, you decide you are "sick and tired of being sick and tired."

You march out of the restaurant and head straight for Success Mansion. When you reach the

---

Paul Ruby, Jr. is the 22-year-old founder of Ruby Software and Consulting. A self-taught programmer, he installs, customizes and writes accounting systems for businesses.

A
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New SAM Chip with heatsink (74LS785)	$29.95
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EPROM Programmer - uses 2716s up to 27512s! Super fast programming! - See April '86 review	$149.95

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CoCo Memory Map	$16.95
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Basic 09 Tour Guide	$19.95
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Color Basic Unraveled	$19.95
Extended Basic Unraveled	$19.95
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CoCo III Service Manual	$39.95
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The Complete Rainbow Guide to OS9	$19.95
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Something possibly wrong with your CoCo??? CoCo CHECKER is the answer!! Will test your ROMs, RAMs, Disk Drives & Controller, Printer, Keyboard, Cassette, Joysticks, Sound, PIAs, VDG, Internal Clock Speed, Multi-Pak Interface and more!! 16K TAPE/DISK **$21.95** (see Jan '85 Rainbow Review)

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Save ROMPAKs to your 64K Disk system using the RS Multi-Pak Interface. Eliminate constant plugging in of ROMPAKs now by keeping all your PAK software on disk. Includes POKEs for "PROBLEM" ROMPAKs- including the NEW 16K PAKS! (Demon Attack,Dragons Lair,etc) 64K DISK **$24.95**

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Now you can write files using any CoCo Word Processor (Telewriter-64, VIP Writer, etc.) and convert them to special Highly Detailed character sets! Some of the character sets supported are Italics, Old English, Futuristic and Block. A character set editor is included to create custom sets or modify existing ones! Supports most dot-matrix printers! DISK **$29.95** (see Dec '85 Rainbow Review)

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Add 24 NEW Disk commands with 2 Hi-Res screens! Supports 40 track & Double-Sided drives, 6 ms stepping, auto disk search, error trapping & "EPROMABLE". 64K DISK ~~$49.95~~ New LOW price!! **$29.95**

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NOW, a program that creates a "USER FRIENDLY" environment within OS-9! The OS-9 SOLUTION replaces 19 of the old "USER HOSTILE" commands with single keystroke, menu driven commands. No more typing in complex long pathnames or remembering complicated syntaxes! Set all XMODE parameters at the touch of keys! ~~$39.95~~ New LOW price!!! **$24.95** (see Sept '85 Rainbow Review)

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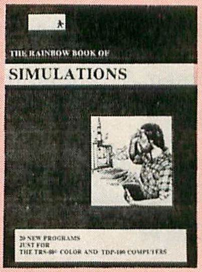
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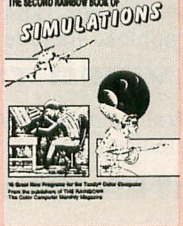
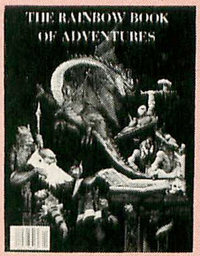
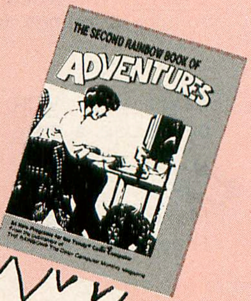

The Complete Rainbow Guide to OS-9

The book that demystifies the state-of-the-art operating system for the Tandy Color Computer. Authors Dale L. Puckett and Peter Dibble show you how to take advantage of OS-9's multitasking and multiuser features, and the capability of redirecting input and output commands at will. An easy-to-read, step-by-step guide packed with hints and tips, tutorials and free software in the form of program listings.

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doorstep you begin to have second thoughts. You remember the rumors of the mansion being haunted.

As you turn to walk away, you realize the entire town has followed you to the doorstep of the mansion. The people begin to laugh at you and dare you to go in. You know if you walk away now, you will never hear the end of it. Your pride is at stake. You decide to show everyone that you can retrieve the 13 scrolls, or your name isn't Joe I. Gonamakit!

Success Mansion is a beginner's Adventure program, that has been designed to progress into a real life adventure. It requires a 32K Color Computer, and either a cassette recorder or one disk drive. (Multipack interface and speech/sound cartridge are optional.) The mansion contains 13 scrolls listing principles of success, which are used by millionaires across the country.

Your goal in the Adventure is to retrieve the 13 scrolls and exit the mansion. While retrieving the scrolls, you will discover other items in the mansion. Examine the items and find them in the real world. Answer the Success Quiz if you can. Try to apply the information you have learned to your life. That is when the *real* Adventure begins.

The program plays like most other text Adventure programs. First, it displays a description of your surroundings. Then, it prompts you for a command, which is composed of one verb followed by a noun. The program will not allow any abbreviations for commands. (Can you figure out the principle behind that?)

Moving in the Mansion

To move through the mansion, you will need to type a verb — either `WALK`, `RUN` or `GO`, followed by a direction. The direction must be either `NORTH`, `SOUTH`, `EAST`, `WEST`, `UP` or `DOWN`. The description, displayed by the program, will list the valid directions that you may use.

Example: `WALK NORTH`

Looking Around

The program will also list objects that are in the room with you. When there are objects in the room with you, you may want to look at some of them. Typing the verb `LOOK` by itself, for a command, displays the room description.

Example: `LOOK DOOR`

Picking Up Objects

Some of the objects in the mansion may be picked up. To pick up an object, simply type the verb `GET` followed by the name of the object you want to pick up.

Example: `GET BOOK`

Taking Inventory

As you explore the mansion, you may forget what you are carrying. To list the objects you are carrying, type the command `INVENTORY` by itself.

Getting A Little Help

If you are having difficulty when you start, try typing the command `HELP`.

Quitting the Adventure

Should you desire to quit the Adventure before finishing it, you can quit by typing the command `QUIT`.

Saving an Adventure

If you do not have time to complete the Adventure during one sitting, you can save it to tape or disk. To save the Adventure, simply type the command `SAVE`. The program will then prompt you for the device to save the Adventure on (tape or disk). If the Adventure is to be saved on tape, put the desired tape in the recorder and press the play and record buttons.

Loading an Adventure

To load a previously saved Adventure, with the present Adventure in memory, simply type the command `LOAD` by itself. The program will then prompt you for the device to load the Adventure from (tape or disk). If the Adventure is saved on tape, make sure the correct tape is in the recorder and press the play button. If the Adventure is saved on disk, make sure the correct disk is in the disk drive.

Talking or Non-talking

If you have the Speech/Sound Program Pak from Radio Shack, this Adventure will talk to you.

During the Adventure, you may want to either turn the talking routine on or off. To turn the talking routine on, type the command `TALK ON`. To turn the talking routine off, type the command `TALK OFF`.

Beware the BREAK Key

Should you press the BREAK key by mistake, you can continue the Adventure where you left off by typing the command `CONT` and pressing ENTER.

Hint

Be sure to write down the things you

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*The JDOS disk operating system will yield unpredictable results when used on a COCO 3. It is recommended that JDOS not be used on the COCO 3. Radio Shack DOS (vers. 1.0 or 1.1) will work in all J&M Controllers.

WE'RE BRINGING THE COCO

RAINBOW'S BROADENING ITS SPECTRUM

THE RAINBOW and the Delphi Information Utility have joined together to allow CoCo owners all over the world to connect with one another!

Delphi is a full-service information utility. It offers everything from up-to-the-minute news stories from The Associated Press to electronic mail services. But, *best of all*, it now has **a special forum for Color Computer owners, and it's operated by the people who bring you THE RAINBOW each month.**

The CoCo Special Interest Group (SIG) features a variety of services, including an open forum where you can send and receive messages from Color Computer owners all over the world. It also has several databases to which you can upload your favorite programs and from which you can download programs written by other CoCo enthusiasts. Some of these databases are BASIC programming, OS-9 and home applications.

When setting up your account with Delphi, if you do not have a credit card or prefer not to use it, Delphi requires that you send $20 to give your account a positive balance. This will be refunded after your first free hour if you choose to no longer use the system or it will be applied to future connect charges. If you do not maintain a positive balance, you will be charged $3.50 each month for direct billing.

PEEK INTO THE RAINBOW

The CoCo SIG's conference feature allows you to meet electronically with other members of the CoCo Community. You can join conferences with notables such as Dale Puckett, Cray Augsburg, Marty Goodman, Don Hutchison, Jim Reed, Lonnie Falk and others — on a regular basis. Conference schedules will appear in THE RAINBOW each month. Be sure to check online announcements for changes and additions.

THE OTHER SIDE OF THE RAINBOW

On Delphi, you also are able to buy RAINBOW ON TAPE — order a whole set, or download an individual program immediately. You can also renew your RAINBOW subscription, make a fast and easy order for software or hardware from a multitude of vendors, or inquire about products on the CoCo SIG.

We also have a number of **programs that you can download** and use, just for the cost of the time you spend transferring them. There'll also be **corrections for RAINBOW articles**, helpful hints and many other useful features.

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THE RAINBOW is offering subscribers a free lifetime subscription to Delphi — a $24.95 value — and a free hour of connect time — a $7.20 value at either 300, 1200 or 2400 Baud — so you can sample Delphi and the RAINBOW CoCo SIG. That's right. Your subscription to THE RAINBOW entitles you to this $32.15 value as a ***free bonus!***

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DELPHI TYPE:
GROUP COCO

COMMUNITY TOGETHER

How to reach RAINBOW's Color Computer SIG . . .

There are several ways to connect to Delphi and THE RAINBOW's CoCo SIG. In most cities you will not even have to pay long distance charges; you can use special data communications networks like Telenet, Tymnet and the Canadian Datapac network.

First, set your terminal program to operate at either 300 or 1200 Baud (depending on the modem you have), and also select either 7 bits with even parity or 8 bits with no parity, and one stop bit. (If one combination doesn't work, try another.)

Decide which network you should use. There is no surcharge for Telenet or Tymnet. Canadian residents using Datapac will be charged an additional $12 (U.S.) per hour.

On Telenet: The Uninet network has now merged with Telenet. To get the Telenet number for your area, call (800) 336-0437. After you call your local access number and make connection, press the ENTER key twice. When the "TERMINAL=" prompt appears, press ENTER again. When the "@" prompt appears, type `C DELPHI` and press ENTER.

On Tymnet: Call (800) 336-0149 to get the Tymnet number for your area. After you dial your designated number and connect, you will see either "garbage" or a message saying "please type your terminal identifier." At this point, even if the screen is garbled, simply press 'A'. When "please log in:" appears, type `DELPHI` and press ENTER.

From Canada (on Datapac): Call Delphi Customer Service at (617) 491-3393 to get the Datapac number for your area. After you connect, press the period key (.) and ENTER (use two periods if you're using 1200 Baud). Type `SET 2:1, 3:126` and press ENTER. Now type `p 1 3106, DELPHI;` and press ENTER. Delphi's new rates indicate an additional $12 hourly surcharge for evening use of Datapac, which means a total of $18 (U.S.) for connect time.

From other countries: Many countries have their own data networks that can connect to either Telenet or Tymnet. Check with the telephone authorities in your country for details on how to sign up for this service. When you have an account set up, you can reach Delphi with a "host code" of 312561703088 through Telenet, or 310600601500 through Tymnet. (You'll have to pay the toll charges for this connection.)

Type in Your Username

If you're already a subscriber to THE RAINBOW, at the "USERNAME:" prompt, type `RAINBOWSUB` and press ENTER. At the "PASSWORD:" prompt, type your individual subscription number from the mailing label of your latest issue of THE RAINBOW. (If there are one or more zeros at the beginning of this number, include them.)

If you don't already have a subscription, at the "USERNAME:" prompt, type `RAINBOWORDER` and press ENTER. At the "PASSWORD:" prompt, type `SENDSUB` and press ENTER. Have your MasterCard, VISA or American Express card ready, because you'll be led through a series of questions that will enable us to put your RAINBOW and Delphi subscriptions into effect. In an effort to hold down non-editorial costs, we do not bill for subscriptions.

If you make a typing error, just press `ENTER` and start over. Remember that at any point, when you're on Delphi, you can type `HELP` to get help on how to use the system. To get off the system just type `BYE`.

If you find that you're unable to log on to Delphi and enter the CoCo SIG after following these instructions, call us during afternoon business hours at (502) 228-4492. We'll be glad to offer assistance.

Come Visit Us! Type: `GROUP COCO`

After you sign in, you'll be prompted to set up your own, personal "user name" — Delphi is a friendly service, no numbers to remember — and you'll be asked a number of questions so Delphi can set up your account. You'll also be assigned a temporary password. No time is assessed against your free hour of service while you answer these questions.

Delphi will tell you that your account will be ready after 6 p.m. the same day if you sign up before noon (Eastern time zone.) If not, your account will be ready at 6 p.m. the next day. Once an account is opened, *each RAINBOW subscriber will be credited with an hour of free time!*

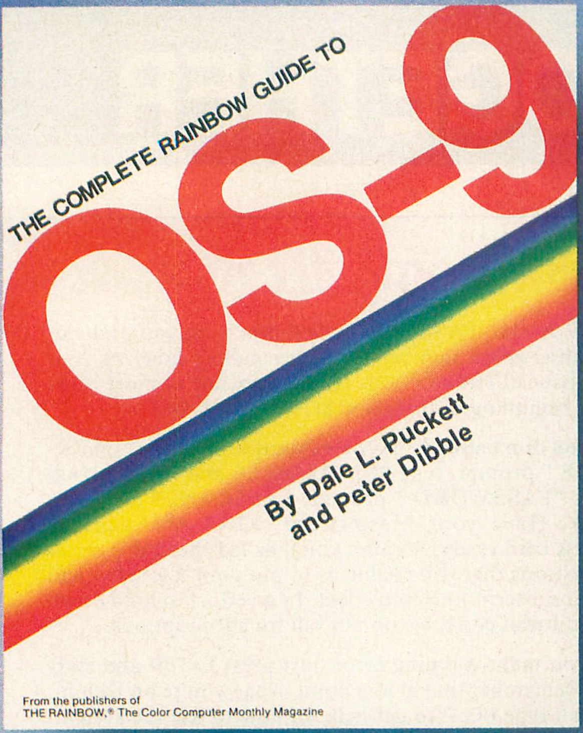
When you log back in, use your chosen username and your temporary password to access the system. At that point, you will meet Max, who will help you configure things and will change your temporary password into your own *personal* password. This is the password you will use for subsequent sessions — or until you change it.

After Max bids you goodbye, you'll wind up at the Delphi Main Menu; type in `GROUP COCO` and **join us on the CoCo SIG!**

More than a book . . .

A MILESTONE

THE COMPLETE RAINBOW GUIDE TO OS-9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find and any observations you make.

Loading the Program From Cassette

1. Type the command: `PCLEAR 1`
2. Type the command: `CLOAD`
3. Type the command: `RUN`

Loading the Program From Disk

1. Type the command: `PCLEAR 1`
2. Type the command: `LOAD "SUCCESS"`
3. Type the command: `RUN`

Enjoy your success!

(Questions about this program may be addressed to Mr. Ruby at Route 3 Box 21, Beeville, TX 78102; 512-358-8819. Please enclose an SASE when writing.) ☐

Success Quiz

Q1: Why must you type `GO`, `WALK` or `RUN` followed by a direction to move through the mansion?

Q2: Why must you exit the mansion with the 13 scrolls?

Q3: Why has the program been written in BASIC instead of machine language?

Q4: What is written on the following scrolls:

A: SCROLL1
B: SCROLL2
C: SCROLL3
D: SCROLL4
E: SCROLL5
F: SCROLL6
G: SCROLL7
H: SCROLL8
I: SCROLL9
J: SCROLL10
K: SCROLL11
L: SCROLL12
M: SCROLL13

Q5: Of all the objects in the mansion, which item contains the detailed description of each of the principles on each scroll?

Q6: List the title of each book on the suggested reading list:

A:
B:
C:
D:

				2310	89
110	253	1360	33	2410	210
250	92	1500	199	2480	28
420	147	1590	165	2520	126
530	147	1680	215	2620	237
680	50	1740	112	2690	42
810	187	1830	1	2790	114
970	121	1900	233	2850	228
1050	231	1990	255	2910	44
1140	250	2060	178	3000	183
1210	76	2140	148	3150	72
1290	200	2220	245	END	169

The listing: `SUCCESS`

```
10 FILES 1,255:CLEAR 1024
20 CLS(RND(8)):PRINT@169,"SUCCES
S MANSION";:PRINT@227,"WRITTEN B
Y : PAUL RUBY JR.";
30 REM
40 PRINT@296,"COPYRIGHT (C) 1986
";:PLAY"T255;L255;V31":FOR A=1TO
31:PLAY"AGCDGEDAGAV-":NEXT
42 PRINT@448,"TALKING ADVENTURE
(Y/N)?";
44 Z$=INKEY$:IF Z$="Y"OR Z$="y"T
HENTK=1ELSE IF Z$="N"OR Z$="n"TH
ENTK=0ELSE 44
46 PRINT@448,STRING$(32,PEEK(102
4));
50 Z1$="SUCCESS MANSION. WRITTEN
 BY PAUL RUBY JUNIOR. COPYRIGHT
9TEEN 8EESIX":GOSUB3100
60 IF TK=1THENFOR Z=1TO5500:NEXT
70 PRINT@489,"<PRESS ANY KEY>";
80 Z1$="PRESS ANY KEE TO CONTINU
E":GOSUB3100
90 A$=INKEY$:IF A$="" THEN 90 EL
SE CLS(RND(8))
100 IFTK=1THENPRINT@168,"ONE MOM
ENT PLEASE";:Z1$="1 MOMENT PLEAS
E":GOSUB3100:FOR Z=1TO1900:NEXT:
FOR Z=1TO20:SOUNDRND(255),1:NEXT
:FOR Z=1TO1000:NEXT:Z1$="HELLO J
OE":GOSUB3100:FORZ=1TO1500:NEXT
110 CLSRND(8):PRINT@165,"THE ADV
ENTURE BEGINS!!!";:Z1$="THE ADVE
NTURE BEGINS":GOSUB 3100
120 DIM L$(35),LO$(32),O$(32),C$
(25),T(6,34),C(25),O(32),T$(6),T
L$(6)
130 FOR C=1 TO 34:READ L$(C):NEX
T
140 FOR C=1 TO 31:READ LO$(C),O$
(C),O(C):NEXT
150 FOR C=1 TO 34:READ T(1,C),T(
2,C),T(3,C),T(4,C),T(5,C),T(6,C)
:NEXT
160 T$(1)="NORTH":T$(2)="SOUTH":
T$(3)="EAST":T$(4)="WEST":T$(5)=
"UP":T$(6)="DOWN"
170 FOR C=1 TO 22:READ C$(C),C(C
):NEXT
180 L=1:M=0
190 CLS:PRINT @480
200 Z$="YOU ARE "+L$(L)+" "
210 Z$=Z$+"YOU SEE "
220 FL=0
230 FOR C=1 TO 31:IF O(C)=L THEN
 240 ELSE 270
240 IF FL=0 THEN Z$=Z$+"A "+LO$(
C) ELSE Z$=Z$+", "+LO$(C)
250 IF LEN(Z$)>32 THEN GOSUB 301
0
260 FL=FL+1
270 NEXT
280 IF FL=0 THEN Z$=Z$+"NOTHING
OUT OF THE ORDINARY"
290 Z$=Z$+". "
300 Z$=Z$+"OBVIOUS EXITS LEAD "
310 FL=0
320 FOR C=1 TO 6:IF T(C,L)>0 THE
```

```
N 330 ELSE 360
330 IF FL=0 THEN Z$=Z$+T$(C) ELS
E Z$=Z$+", "+T$(C)
340 IF LEN(Z$)>32 THEN GOSUB 301
0
350 FL=FL+1
360 NEXT:Z$=Z$+". "
370 IF T(1,L)<0 AND T(1,L)>-3 TH
EN Z$=Z$+"TO THE NORTH IS A CLOS
ED DOOR. "
380 IF T(2,L)<0 AND T(2,L)>-3 TH
EN Z$=Z$+"TO THE SOUTH IS A CLOS
ED DOOR. "
390 IF T(3,L)<0 AND T(3,L)>-3 TH
EN Z$=Z$+"TO THE EAST IS A CLOSE
D DOOR. "
400 IF T(4,L)<0 AND T(4,L)>-3 TH
EN Z$=Z$+"TO THE WEST IS A CLOSE
D DOOR. "
410 IF T(3,L)=-3 THEN Z$=Z$+"TO
THE EAST IS A CLOSED METAL PANEL
. "
420 IF T(4,L)=-3 THEN Z$=Z$+"TO
THE WEST IS A CLOSED METAL PANEL
. "
430 Z=RND(1000):IF Z>950 THEN Z$
=Z$+" YOU CAN HEAR THE PEOPLE ST
ILL LAUGHING AT YOU OUT SIDE. "
440 IF Z>900 AND Z<950THEN Z$=Z$
+" THE TOWNS PEOPLE STILL LAUGH
AT YOUR ADVENTURE. "
450 IF Z<50 THEN Z$=Z$+" YOU REM
INISCE OF YOUR BEST FRIENDS LAUG
HING AT YOUR TALK OF SUCCESS. "
460 IF LEN(Z$)>32 THEN GOSUB 301
0
470 IF Z$<>""THEN PRINT Z$:Z1$=Z
$:Z$="":GOSUB3100
480 PRINT@0,"total moves:";STR$(
M):PRINT@480,"";:LINE INPUT "=>"
;A$
490 A4$="":IF A$="" THEN 480
500 FOR C=1 TO LEN(A$):A3$=MID$(
A$,C,1):IF ASC(A3$)>96 AND ASC(A
3$)<122 THEN A4$=A4$+CHR$(ASC(A3
$)-32) ELSE A4$=A4$+A3$
510 NEXT:A$=A4$
515 IF INSTR(A$,"TALK ON")THENTK
=1:GOTO480:ELSEIFINSTR(A$,"TALK
OFF")THENTK=0:GOTO480
520 M=M+1
530 WN=0:FOR C=19 TO 31:IF O(C)<
1000 THEN WN=1 ELSE NEXT
540 IF WN=0 THEN T(2,1)=999
550 IF L=1 OR L=3 OR L=6 OR L=7
OR L=14 OR L=15 OR L=30 OR L=31
THEN DT=1
560 FOR C=1 TO 6:IF T(C,L)<0 THE
N DT=2 ELSE NEXT
```

```
570 FOR C=1 TO 6:IF T(C,L)<-1 TH
EN DT=3 ELSE NEXT
580 FOR C=1 TO LEN(A$):IF MID$(A
$,C,1)=" " THEN A1$=LEFT$(A$,C-1
):B$=MID$(A$,C+1,LEN(A$)-C):GOTO
600 ELSE NEXT
590 A1$=A$
600 FOR C=1 TO 22
610 IF C$(C)=A1$ THEN A=C(C):GOT
O640
620 NEXT
630 Z$="I DO NOT UNDERSTAND THE
VERB IN YOUR COMMAND. PLEASE TRY
 ANOTHER COMMAND.":GOSUB3010:GOT
O430
640 FL=0:IF INSTR(B$+" "," DESK
")THEN B1$="DESK":FL=1
650 IF INSTR(B$+" "," HUTCH ")TH
EN B1$="HUTCH":FL=1
660 IF INSTR(B$+" "," TABLE ")TH
EN B1$="TABLE":FL=1
670 IF INSTR(B$+" "," BOOKSHELF
")THEN B1$="BOOKSHELF":FL=1
680 IF INSTR(B$+" "," STATUE ")T
HEN B1$="STATUE":FL=1
690 IF INSTR(B$+" "," MAT ")THEN
 B1$="MAT":FL=1
700 IF INSTR(B$+" "," KEY ")THEN
 B1$="KEY":FL=1
710 IF INSTR(B$+" "," SCROLL ")T
HEN B1$="SCROLL":FL=1
720 IF INSTR(B$+" "," DOOR ")THE
N B1$="DOOR":FL=1
730 IF INSTR(B$+" "," PANEL ")TH
EN B1$="PANEL":FL=1
740 IF FL=1 THEN B$=B1$
750 FOR C=1 TO 31:IF INSTR(B$+"
"," "+O$(C)+" ") THEN B$=O$(C)
760 NEXT
770 FOR C=1 TO LEN(B$):IF MID$(B
$,C,1)=" " THEN B1$=LEFT$(B$,C-1
) ELSE NEXT
780 IF B1$="A" OR B1$="THE" OR B
1$="AT"OR B1$="TO"THEN B$=MID$(B
$,C+1,LEN(B$)-C):B1$="":GOTO770
790 ON A GOTO 810,930,1360,1450,
1550,1640,1790,1970,2210,2370,24
20,2470,2520,2560
800 'INVENTORY
810 CLS:PRINT"YOU ARE CARRYING T
HE FOLLOWING:":PRINT:Z1$="YOU AR
E CARRYING THE FOLLOWING...":GOS
UB3100
820 Z$=""
830 FOR C=1 TO 31
840 IF O(C)=1000 THEN Z$=Z$+"-"+
LO$(C)+"- "
850 IF LEN(Z$)>32THEN GOSUB3010
860 NEXT
```

```
870 IF Z$="" THEN PRINT:PRINT TA
B(12);"NOTHING":Z1$="NOTHING":GO
SUB3100
880 IF LEN(Z$)>32THENGOSUB3010
890 IF Z$<>""THEN PRINT Z$:Z1$=Z
$:GOSUB3100
900 PRINT@489,"<PRESS ANY KEY>";
:Z1$="PRESS ANY KEY TO CONTINUE"
:GOSUB3100
910 A$=INKEY$:IF A$="" THEN 910
920 CLS:GOTO 200
930 IF A$=A1$ THEN 200
940 IF B$="KEY"OR B$="SCROLL"THE
NZ$="THIS MANSION HAS MORE THAN
ONE "+B$+" IN IT. YOU WILL HAVE
TO SPECIFY WHICH ONE YOU WANT.":
GOSUB3010:GOTO430
950 IF B$="KEY1"AND O(3)=1000THE
NZ$="IT LOOKS LIKE IT MIGHT UNLO
CK A DOOR.":GOSUB3010:GOTO430
960 IF B$="KEY2"AND O(4)=1000THE
NZ$="IT LOOKS LIKE AN ORDINARY M
ETAL KEY.":GOSUB3010:GOTO430
970 IF B$="KEY3"AND O(5)=1000THE
NZ$="IT IS YOUR AVERAGE METAL KE
Y.":GOSUB3010:GOTO430
980 IF B$="KEY4"AND O(6)=1000THE
NZ$="IT HAS THE LETTERS M.B. ON
IT.":GOSUB3010:GOTO430
990 IF B$="PAPER"AND O(1)=1000TH
ENZ$="THE NUMBERS 9-6-3-1-4-7 AR
E WRITTEN ON IT.":GOSUB3010:GOTO
430
1000 IF B$="CARD"AND O(2)=1000TH
ENZ$="THE PLASTIC CARD READS 2-4
-6-8 .":GOSUB3010:GOTO430
1010 IF B$="MAT"AND L=1THENZ$="I
T READS WELCOME TO SUCCESS MANSI
ON. ONE CORNER IS WORN, AS IF IT
 HAS BEEN MOVED QUITE OFTEN IN T
HE PAST.":GOSUB3010:GOTO430
1020 IF B$="SCROLL1"AND O(20)=10
00THENZ$="IT READS the scroll of
 desire.":GOSUB3010:GOTO430
1030 IF B$="SCROLL2"AND O(21)=10
00THENZ$="IT READS the scroll of
 faith.":GOSUB3010:GOTO430
1040 IF B$="SCROLL3"AND O(22)=10
00THENZ$="IT READS the scroll of
 autosuggestion.":GOSUB3010:GOTO
430
1050 IF B$="SCROLL4"AND O(23)=10
00THENZ$="IT READS the scroll of
 specialized knowledge.":GOSUB30
10:GOTO430
1060 IF B$="SCROLL5"AND O(24)=10
00THENZ$="IT READS the scroll of
 imagination.":GOSUB3010:GOTO430
1070 IF B$="SCROLL6"AND O(25)=10
00THENZ$="IT READS the scroll of
 organizedplanning.":GOSUB3010:G
OTO430
1080 IF B$="SCROLL7"AND O(26)=10
00THENZ$="IT READS the scroll of
 decision.":GOSUB3010:GOTO430
1090 IF B$="SCROLL8" AND O(27)=1
000THENZ$="IT READS the scroll o
f persistence.":GOSUB3010:GOTO43
0
1100 IF B$="SCROLL9"AND O(28)=10
00THENZ$="IT READS the scroll of
 the master mind.":GOSUB3010:GOT
O430
1110 IF B$="SCROLL10"AND O(29)=1
000THENZ$="IT READS the scroll o
f sex transmutation. BEHIND EVER
Y SUCCESSFULL MAN IS A SUCCESSFU
LL WOMAN.":GOSUB3010:GOTO430
1120 IF B$="SCROLL11"AND O(30)=1
000THENZ$="IT READS the scroll o
f the subconscious mind.":GOSUB3
010:GOTO430
1130 IF B$="SCROLL12"AND O(31)=1
000THENZ$="IT READS the scroll o
f the brain. ":GOSUB3010:GOTO430
1140 IF B$="SCROLL13"AND O(19)=1
000THENZ$="IT READS the scroll o
f the sixthsense.":GOSUB3010:GOT
O430
1150 IF B$="DOOR"AND DT=2THENZ$=
"THE DOOR IS CLOSED.":GOSUB3010:
GOTO430
1160 IF B$="DOOR"AND DT=3THENZ$=
"THE DOOR IS LOCKED.":GOSUB3010:
GOTO430
1170 IF B$="DOOR"AND DT=0THENZ$=
"YOU LOOK AROUND, BUT DON'T SEE
A DOOR.":GOSUB3010:GOTO430
1180 IF B$="DOOR"AND DT=1THENZ$=
"THE DOOR IS OPEN.":GOSUB3010:GO
TO430
1190 IF B$="DESK"AND L=7THENZ$="
IT IS A SOLID OAK DESK. THE DESK
 HAS A SMALL DRAWER.":GOSUB3010:
GOTO430
1200 IF B$="DESK"AND L=29THENZ$=
"IT IS A LARGE WALNUT DESK. THER
E IS A LARGE DRAWER ON THE LEFT
SIDE OF THE DESK.":GOSUB3010:GOT
O430
1210 IF B$="DESK"AND L=14THENZ$=
"IT IS A LARGE METAL DESK. THERE
 IS A SMALL METAL DRAWER ON THE
RIGHT SIDE OF THE DESK.":GOSUB30
10:GOTO430
1220 IF B$="DRAWER"AND(L=7OR L=2
9OR L=14)THEN Z$="THE DRAWER IS
UNLOCKED.":GOSUB3010:GOTO430
```

```
1230 IF B$="BOOKSHELF"AND L=2 AN
DO(16)>-4THENZ$="IT IS A LARGE B
OOKSHELF EXTENDING THE LENGTH OF
 THE WALL.":GOSUB3010:GOTO430
1240 IF B$="BOOKSHELF"AND L=2 AN
D O(16)=-4THENZ$="THERE IS A PAP
ERBACK BOOK ON ONE OF THE SHELVE
S.":GOSUB3010:O(16)=L:GOTO430
1250 IF B$="BOOK"AND O(16)=1000T
HENZ$="THE TITLE OF THE BOOK IS
think and grow rich WRITTEN BY N
APOLEON HILL.":GOSUB3010:GOTO430
1260 IF B$="HUTCH"AND L=17THENZ$
="IT IS MADE OF MAHOGANY, AND IT
 IS NOT LOCKED.":GOSUB3010:GOTO4
30
1270 IF L=7OR L=8OR L=29OR L=30A
ND B$="PANEL"THENZ$="EXAMINING T
HE PANEL, YOU NOTICE A SMALL KEY
PAD FOR ENTERING NUMBERS. YOU RE
ALIZE YOU WILL HAVE TO HAVE THE
CORRECT COMBINATION TO 'OPEN' OR
 'CLOSE' THE PANEL.":GOSUB3010:G
OTO430
1280 IF B$="TABLE" AND L=18 AND
O(26)<0 THEN O(26)=L:O(17)=L:Z$=
 "YOU NOTICE A SMALL PAMPHLET AN
D THE 'SCROLL7'.":GOSUB3010:GOTO
 430
1290 IF B$="TABLE" AND L=18 AND
O(26)>0 THENZ$= "IT IS A LARGE T
ABLE WITH A TIGER CLAW PEDESTAL.
":GOSUB3010:GOTO 430
1300 IF B$="BOOKLET" AND O(15)=1
000 THENZ$= "IT READS 'THE JUNKF
OOD WITHDRAWAL MANUAL' BY MONTE
KLINE.":GOSUB3010:GOTO 430
1310 IF B$="PAMPHLET" AND O(17)=
1000 THENZ$= "IT CONTAINS A LIST
 OF BOOKS: HOLY BIBLE, '7 KEYS T
O A LONGER LIFE' BY DR. HANS J.
KUGLER, 'THE MAGIC OF BELIEVING'
 BY CLAUDE BRISTOL, 'THE GREATES
T SALESMAN IN THE WORLD' BY OG M
ANDINO.":GOSUB3010:GOTO43
1320 IF B$="JACKET" AND O(14)=10
00 THENZ$="IT IS YOUR AVERAGE DR
ESS JACKET.":GOSUB3010:GOTO 430
1330 IF B$="STATUE" AND L=10 THE
NZ$= "THIS IS A BEAUTIFUL MARBLE
 STATUE OF CUPID.":GOSUB3010:GOT
O 430
1340 Z$="YOU DO NOT HAVE THE "+B
$+". ":GOSUB3010
1350 GOTO 430
1360 FOR C=1 TO 6:IF B$=T$(C) TH
EN DR=C:GOTO 1380
1370 NEXT:GOTO 1430
1380 IF T(DR,L)>0 THEN L=T(DR,L)
:GOTO 1400
1390 IF T(DR,L)=<0THEN Z$="YOU C
AN NOT GO THAT WAY.":GOSUB3010:G
OTO430
1400 IF L=1000AND WN>0THEN2720
1410 IF L=999THEN2770
1420 GOTO200
1430 Z$="PLEASE TRY A DIRECTION.
":GOSUB3010:GOTO430
1440 '
1450 IF B$="SCROLL"OR B$="KEY"TH
ENZ$="THIS MANSION HAS MORE THAN
 ONE "+B$+" IN IT, THEREFORE, YO
U WILL HAVE TO SPECIFY WHICH ONE
.":GOSUB3010:GOTO430
1460 IF B$="JACKET"AND O(22)=-1T
HENZ$="AS YOU PICK UP THE JACKET
, SOMETHING FALLS FROM ONE OF TH
E POCKETS. YOU TAKE A CLOSER LOO
K, AND REALIZE IT IS THE VALUABL
E 'SCROLL3'.":GOSUB3010:O(22)=21
:O(14)=1000:GOTO430
1470 FOR C=1TO31
1480 IF B$=O$(C)AND O(C)=L AND O
$(C)<>"*"THEN O(C)=1000:Z$=LO$(C
)+" HAS BEEN TAKEN.":GOSUB3010:G
OTO430
1490 NEXT
1500 FOR C=1TO31
1510 IF B$=O$(C)AND O(C)=1000THE
NZ$="YOU ALREADY HAVE THE "+LO$(
C)+".":GOSUB3010:GOTO430
1520 NEXT
1530 Z$="YOU ARE UNABLE TO TAKE
THE "+B$+".":GOSUB3010:GOTO430
1540 '
1550 IF B$="MAT"AND L=1AND O(3)=
-1THENZ$="AS YOU MOVE THE WELCOM
E MAT, YOU NOTICE THE 'KEY1' UND
ER THE MAT.":GOSUB3010:O(3)=L:GO
TO430
1560 IF B$="MAT"AND L=1AND O(3)>
1THENZ$="YOU MOVE THE MAT, BUT S
EE ONLY A PILE OF DIRT.":GOSUB30
10:GOTO430
1570 IF B$="MAT"AND L=1AND O(3)=
1THENZ$="THE 'KEY1' IS STILL HER
E ON THE PORCH.":GOSUB3010:GOTO4
30
1580 IF B$="FIGURE"AND L=10AND O
(19)>0THENZ$="YOU MOVE THE FIGUR
E OF CUPID, BUT NOTHING HAPPENS.
":GOSUB3010:GOTO430
1590 IF B$="STATUE"AND L=10AND O
(19)<0THENZ$="YOU MOVE THE STATU
E OF CUPID, REVEALING A COMPARTM
ENT CONTAINING THE 'SCROLL13'.":
O(19)=10:GOSUB3010:GOTO430
1600 IF B$="DOOR"THENZ$="AROUND
```

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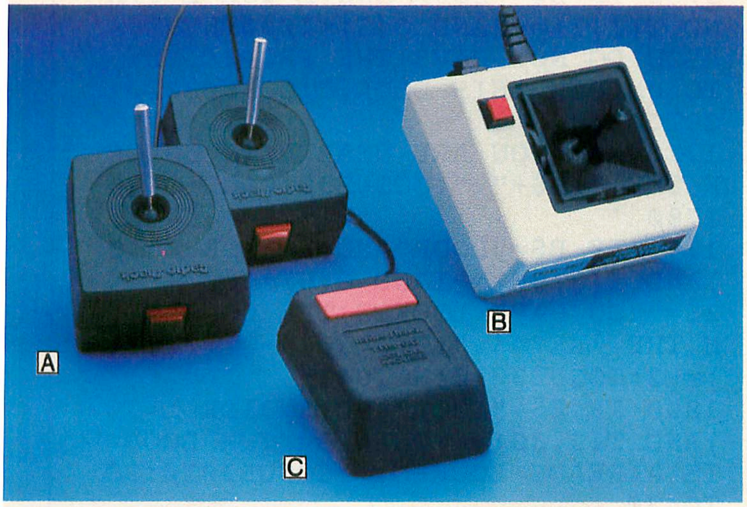

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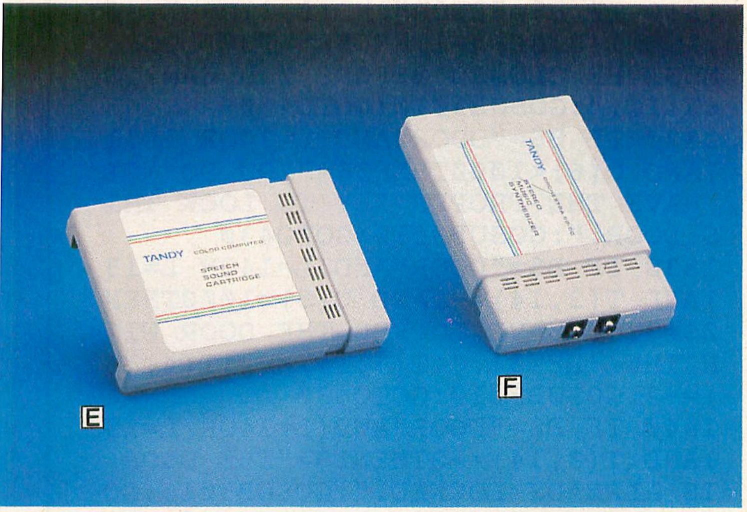
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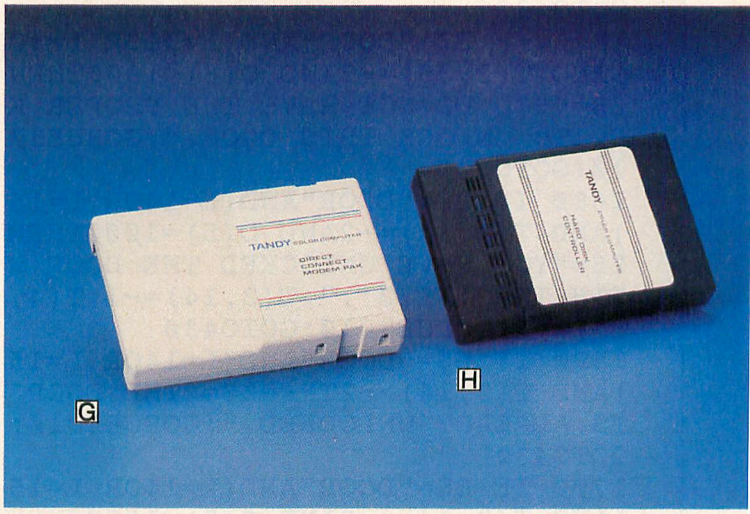
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```
HERE WE 'OPEN' AND 'CLOSE' DOORS
.":GOSUB3010:GOTO430
1610 IF B$="PANEL"THENZ$="THE PA
NEL WILL 'OPEN' OR 'CLOSE'WITH T
HE CORRECT COMBINATION.":GOSUB30
10:GOTO430
1620 Z$="YOU ARE UNABLE TO MOVE
THE "+B$+".":GOSUB3010:GOTO430
1630 '
1640 IF A$=A1$THENZ$="YOU MUST S
PECIFY WHAT YOU WANT TO UNLOCK."
:GOSUB3010:GOTO430
1650 IF B$="DOOR"AND(L=31OR L=30
)AND T(3,30)=-2AND O(6)=1000THEN
Z$="YOU HAVE UNLOCKED THE DOOR W
ITH THE 'KEY4'.":T(4,31)=-1:T(3,
30)=-1:GOSUB3010:GOTO430
1660 IF B$="DOOR"AND(L=31OR L=30
)AND T(3,30)>-2THENZ$="THE DOOR
IS ALREADY UNLOCKED.":GOSUB3010:
GOTO430
1670 IF B$="DOOR"AND(L=31OR L=30
)AND T(3,30)=-2AND O(6)<1000THEN
Z$="YOU DO NOT HAVE THE PROPER K
EY TO UNLOCK THIS DOOR.":GOSUB30
10:GOTO430
1680 IF B$="DOOR"AND(L=14OR L=15
)AND T(3,14)=-2AND O(5)=1000THEN
Z$="YOU HAVE UNLOCKED THE DOOR W
ITH THE 'KEY3'.":T(3,14)=-1:T(4,
15)=-1:GOSUB3010:GOTO430
1690 IF B$="DOOR"AND(L=14OR L=15
)AND T(3,14)>-2THENZ$="THE DOOR
IS ALREADY UNLOCKED.":GOSUB3010:
GOTO430
1700 IF B$="DOOR"AND(L=14OR L=15
)AND T(3,14)=-2AND O(5)<1000THEN
Z$="YOU DO NOT HAVE THE PROPER K
EY TO UNLOCK THIS DOOR.":GOSUB30
10:GOTO430
1710 IF B$="DOOR"AND(L=6OR L=7)A
ND T(3,6)=-2AND O(4)=1000THENZ$=
"YOU HAVE UNLOCKED THE DOOR WITH
 THE 'KEY2'.":T(3,6)=-1:T(4,7)=-
1:GOSUB3010:GOTO430
1720 IF B$="DOOR"AND(L=6OR L=7)A
ND T(3,6)>-2THENZ$="THE DOOR IS
ALREADY UNLOCKED.":GOSUB3010:GOT
O430
1730 IF B$="DOOR"AND(L=6OR L=7)A
ND O(4)<1000THENZ$="YOU DO NOT H
AVE THE PROPER KEY TO UNLOCK THI
S DOOR.":GOSUB3010:GOTO430
1740 IF B$="DOOR"AND(L=1OR L=3)A
ND T(1,1)=-2AND O(3)=1000THENZ$=
"YOU HAVE UNLOCKED THE DOOR WITH
 THE 'KEY1'.":T(1,1)=-1:T(2,3)=-
1:GOSUB3010:GOTO430
1750 IF B$="DOOR"AND(L=1OR L=3)A
ND T(1,1)>-2THENZ$="THE DOOR IS
ALREADY UNLOCKED.":GOSUB3010:GOT
O430
1760 IF B$="DOOR"AND(L=1OR L=3)A
ND T(1,1)=-2AND O(3)<1000THENZ$=
"YOU DO NOT HAVE THE PROPER KEY
TO UNLOCK THIS DOOR.":GOSUB3010:
GOTO430
1770 Z$="YOU ARE UNABLE TO UNLOC
K THE "+B$+".":GOSUB3010:GOTO430
1780 '
1790 IF B$="DOOR"AND(L=31OR L=30
)AND T(3,30)=-1AND O(6)=1000THEN
Z$="YOU HAVE LOCKED THE DOOR WIT
H THE 'KEY4'.":T(3,30)=-2:T(4,31
)=-2:GOSUB3010:GOTO430
1800 IF B$="DOOR"AND(L=31OR L=30
)AND T(3,30)=-1THENZ$="THE DOOR
IS ALREADY LOCKED.":GOSUB3010:GO
TO430
1810 IF B$="DOOR"AND(L=31OR L=30
)AND T(3,30)>-1THENZ$="THE DOOR
MUST BE CLOSED BEFORE YOU CAN LO
CK IT.":GOSUB3010:GOTO430
1820 IF B$="DOOR"AND(L=30OR L=31
)AND O(6)<1000THENZ$="YOU DO NOT
 HAVE THE PROPER KEY TO LOCK THI
S DOOR.":GOSUB3010:GOTO430
1830 IF B$="DOOR"AND(L=14OR L=15
)AND T(3,14)=-1AND O(5)=1000THEN
Z$="YOU HAVE LOCKED THE DOOR WIT
H THE 'KEY3'.":T(3,14)=-2:T(4,15
)=-2:GOSUB3010:GOTO430
1840 IF B$="DOOR"AND(L=14OR L=15
)AND T(3,14)=-2THENZ$="THE DOOR
IS ALREADY LOCKED.":GOSUB3010:GO
TO430
1850 IF B$="DOOR"AND(L=14OR L=15
)AND T(3,14)>-1THENZ$="THE DOOR
MUST BE CLOSED BEFORE YOU CAN LO
CK IT.":GOSUB3010:GOTO430
1860 IF B$="DOOR"AND(L=14OR L=15
)AND O(5)<1000THENZ$="YOU DO NOT
 HAVE THE PROPER KEY TO LOCK THI
S DOOR.":GOSUB3010:GOTO430
1870 IF B$="DOOR"AND(L=6OR L=7)A
ND T(3,6)=-1AND O(4)=1000THENZ$=
"YOU HAVE LOCKED THE DOOR WITH T
HE 'KEY2'.":T(3,6)=-2:T(4,6)=-2:
GOSUB3010:GOTO430
1880 IF B$="DOOR"AND(L=6OR L=7)A
ND T(3,6)=-2THENZ$="THE DOOR IS
ALREADY LOCKED.":GOSUB3010:GOTO4
30
1890 IF B$="DOOR"AND(L=6OR L=7)A
ND T(3,6)>-1THENZ$="YOU MUST CLO
SE THE DOOR BEFORE YOU CAN LOCK
IT.":GOSUB3010:GOTO430
1900 IF B$="DOOR"AND(L=6OR L=7)A
```

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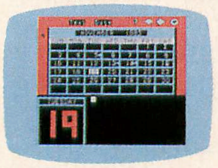

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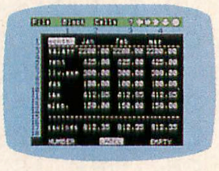

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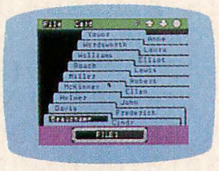

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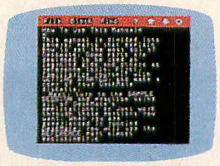

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Datafile
Budget
April85
Friends
Bulletin
Kidstuff
Resumes
Year1985
Compusrv
DowJones
Picture1
May85
Recipes
Entrpriz
1
2
3

```
ND O(4)<1000THENZ$="YOU DO NOT H
AVE THE PROPER KEY TO LOCK THIS
DOOR.":GOSUB3010:GOTO430
1910 IF B$="DOOR"AND(L=1OR L=3)A
ND T(1,1)=-1AND O(3)=1000THENZ$=
"YOU HAVE LOCKED THE DOOR WITH T
HE 'KEY1'.":T(1,1)=-2:T(2,3)=-2:
GOSUB3010:GOTO430
1920 IF B$="DOOR"AND(L=1OR L=3)A
ND T(1,1)=-2AND O(3)=1000THENZ$=
"THE DOOR IS ALREADY LOCKED.":GO
SUB3010:GOTO430
1930 IF B$="DOOR"AND(L=1OR L=3)A
ND T(1,1)>-1THENZ$="YOU MUST CLO
SE THE DOOR BEFORE YOU CAN LOCK
IT.":GOSUB3010:GOTO430
1940 IF B$="DOOR"AND(L=1OR L=3)A
ND O(3)<1000THENZ$="YOU DO NOT H
AVE THE PROPER KEY TO LOCK THIS
DOOR.":GOSUB3010:GOTO430
1950 Z$="YOU ARE UNABLE TO LOCK
THE "+B$+".":GOSUB3010:GOTO430
1960 '
1970 IF A$=A1$THENZ$="YOU MUST S
PECIFY WHAT YOU WANT TO OPEN.":G
OSUB3010:GOTO430
1980 IF B$="DOOR"AND(L=31OR L=30
)AND T(3,30)=-1THENZ$="YOU HAVE
OPENED THE DOOR.":T(3,30)=31:T(4
,31)=30:GOSUB3010:GOTO430
1990 IF B$="DOOR"AND(L=31OR L=30
)AND T(3,30)>-1THENZ$="THE DOOR
IS ALREADY OPEN.":GOSUB3010:GOTO
430
2000 IF B$="DOOR"AND(L=31OR L=30
)AND T(3,30)=-2THENZ$="YOU MUST
UNLOCK THE DOOR BEFORE YOU CAN O
PEN IT.":GOSUB3010:GOTO430
2010 IF B$="DOOR"AND(L=14OR L=15
)AND T(3,14)=-1THENZ$="YOU HAVE
OPENED THE DOOR.":T(3,14)=15:T(4
,15)=14:GOSUB3010:GOTO430
2020 IF B$="DOOR"AND(L=14OR L=15
)AND T(3,14)=-2THENZ$="YOU MUST
UNLOCK THE DOOR BEFORE YOU CAN O
PEN IT.":GOSUB3010:GOTO430
2030 IF B$="DOOR"AND(L=14OR L=15
)AND T(3,14)>-1THENZ$="THE DOOR
IS ALREADY OPEN.":GOSUB3010:GOTO
430
2040 IF B$="DOOR"AND(L=6OR L=7)A
ND T(3,6)=-1THENZ$="YOU HAVE OPE
NED THE DOOR.":T(3,6)=7:T(4,7)=6
:GOSUB3010:GOTO430
2050 IF B$="DOOR"AND(L=6OR L=7)A
ND T(3,6)>-1THENZ$="THE DOOR IS
ALREADY OPEN.":GOSUB3010:GOTO430
2060 IF B$="DOOR"AND(L=6OR L=7)A
ND T(3,6)=-2THENZ$="YOU MUST UNL
OCK THE DOOR BEFORE YOU CAN OPEN
 IT.":GOSUB3010:GOTO430
2070 IF B$="DOOR"AND(L=1OR L=3)A
ND T(1,1)=-1THENZ$="YOU HAVE OPE
NED THE DOOR.":T(1,1)=3:T(2,3)=1
:GOSUB3010:GOTO430
2080 IF B$="DOOR"AND(L=1OR L=3)A
ND T(1,1)>-1THENZ$="THE DOOR IS
ALREADY OPEN.":GOSUB3010:GOTO430
2090 IF B$="DOOR"AND(L=1OR L=3)A
ND T(1,1)=-2THENZ$="YOU MUST UNL
OCK THE DOOR BEFORE YOU CAN OPEN
 IT.":GOSUB3010:GOTO430
2100 IF L=17AND B$="HUTCH"AND O(
28)<0THENZ$="AS YOU OPEN THE HUT
CH, THE 'SCROLL9' DROPS TO THE F
LOOR. THE DOOR ON THE HUTCH SWIN
GS SHUT WHEN YOU LET IT GO.":O(2
8)=17:GOSUB3010:GOTO430
2110 IF L=17AND B$="HUTCH"AND O(
28)>0THENZ$="YOU OPEN THE HUTCH,
 AND SEE NOTHING INSIDE.  THE DO
OR ON THE HUTCH SWINGS SHUT WHEN
 YOU LET IT GO.":GOSUB3010:GOTO4
30
2120 IF B$="PANEL"AND(L=7OR L=8O
R L=29OR L=30)THEN GOSUB 2600:GO
TO430
2130 IF B$="DRAWER"AND L=7AND O(
2)<0THEN O(2)=L:O(29)=L:Z$="WHEN
 YOU OPEN UP THE DRAWER, YOU SEE
 A PLASTIC ID CARD AND THE VALUA
BLE 'SCROLL10'.":GOSUB3010:GOTO4
30
2140 IF B$="DRAWER"AND L=7AND O(
2)>0THENZ$="THE DRAWER IS NOW OP
EN.":GOSUB3010:GOTO430
2150 IF B$="DRAWER"AND L=14AND O
(21)<0THENZ$="OPENING THE DRAWER
 REVEALS THE VALUABLE 'SCROLL2'.
":O(21)=L:GOSUB3010:GOTO430
2160 IF B$="DRAWER"AND L=14AND O
(21)>0THENZ$="THE DRAWER IS OPEN
.":GOSUB3010:GOTO430
2170 IF B$="DRAWER"AND L=29AND O
(1)<0THENZ$="OPENING THE DRAWER
REVEALS A WRINKLED PIECE OF PAPE
R, THE 'SCROLL8', AND THE 'SCROL
L11'.":O(1)=L:O(27)=L:O(30)=L:GO
SUB3010:GOTO430
2180 IF B$="DRAWER"AND L=29AND O
(1)>0THENZ$="THE DRAWER IS NOW O
PEN.":GOSUB3010:GOTO430
2190 Z$="YOU ARE UNABLE TO OPEN
THE "+B$+".":GOSUB3010:GOTO430
2200 '
2210 IF A$=A1$THENZ$="YOU MUST S
PECIFY WHAT YOU WANT TO CLOSE.":
GOSUB3010:GOTO430
```

```
2220 IF B$="DOOR"AND(L=31OR L=30
)AND T(3,30)>0THENZ$="YOU HAVE C
LOSED THE DOOR.":T(3,30)=-1:T(4,
31)=-1:GOSUB3010:GOTO430
2230 IF B$="DOOR"AND(L=31OR L=30
)AND T(3,30)<0THENZ$="THE DOOR I
S ALREADY CLOSED.":GOSUB3010:GOT
O430
2240 IF B$="DOOR"AND(L=14OR L=15
)AND T(3,14)>-1THENZ$="YOU HAVE
CLOSED THE DOOR.":T(3,14)=-1:T(4
,15)=-1:GOSUB3010:GOTO430
2250 IF B$="DOOR"AND(L=14OR L=15
)AND T(3,14)<0THENZ$="THE DOOR I
S ALREADY CLOSED.":GOSUB3010:GOT
O430
2260 IF B$="DOOR"AND(L=6OR L=7)A
ND T(3,6)=-1THENZ$="YOU HAVE CLO
SED THE DOOR.":T(3,6)=-1:T(4,7)=
-1:GOSUB3010:GOTO430
2270 IF B$="DOOR"AND(L=6OR L=7)A
ND T(3,6)>-1THENZ$="THE DOOR IS
ALREADY CLOSED.":GOSUB3010:GOTO4
30
2280 IF B$="DOOR"AND(L=1OR L=3)A
ND T(1,1)>-1THEN Z$="YOU HAVE CL
OSED THE DOOR.":T(1,1)=-1:T(2,3)
=-1:GOSUB3010:GOTO430
2290 IF B$="DOOR"AND(L=1OR L=2)A
ND T(1,1)<0THENZ$="THE DOOR IS A
LREADY CLOSED.":GOSUB3010:GOTO43
0
2300 IF L=17AND B$="HUTCH"THENZ$
="THE HUTCH IS ALREADY CLOSED.":
GOSUB3010:GOTO430
2310 IF B$="PANEL"AND(L=7OR L=8O
R L=29OR L=30)THEN GOSUB2600:GOT
O430
2320 IF B$="DRAWER"AND L=7THENZ$
="THE DRAWER IS CLOSED.":GOSUB30
10:GOTO430
2330 IF B$="DRAWER"AND L=14THENZ
$="THE DRAWER IS CLOSED.":GOSUB3
010:GOTO430
2340 IF B$="DRAWER"AND L=29THENZ
$="THE DRAWER IS NOW CLOSED.":GO
SUB3010:GOTO430
2350 Z$="YOU ARE UNABLE TO CLOSE
 THE "+B$+".":GOSUB3010:GOTO430
2360 '
2370 IF B$="SCROLL"OR B$="KEY"TH
ENZ$="THIS MANSION HAS MORE THAN
 ONE "+B$+" IN IT. YOU WILL HAVE
 TO SPECIFY WHICH ONE.":GOSUB301
0:GOTO430
2380 FOR C=1 TO 31
2390 IF B$=O$(C)AND O(C)=1000AND
 O$(C)<>"*"THEN O(C)=L:Z$=LO$(C)
+" HAS BEEN DROPPED.":GOSUB3010:
GOTO430
2400 NEXT
2410 Z$="YOU DO NOT HAVE A "+B$+
".":GOSUB3010:GOTO430
2420 '  S A V E
2430 PRINT:Z$="I AM CAPABLE OF S
AVING THIS ADVENTURE ON 'TAPE' O
R 'DISK'.":GOSUB3010:PRINTZ$:Z1$
=Z$:GOSUB3100:Z$=""
2431 Z$="ON WHICH DEVICE SHALL I
 SAVE THE ADVENTURE":GOSUB3010:P
RINTZ$;:Z1$=Z$:GOSUB3100:Z$="":I
NPUTQ$
2440 IF Q$<>"TAPE"ANDQ$<>"DISK"T
HENZ$="O.K. JOE.  YOU MUST TYPE
EITHER 'TAPE' OR 'DISK'. I DID N
OT SAVE THE ADVENTURE.":GOSUB301
0:PRINTZ$:Z1$=Z$:GOSUB3100:Z$=""
:GOTO430
2450 IFQ$="TAPE"THENGOSUB3250:Z1
$="SAVING":PRINTZ1$:GOSUB3010:OP
EN"O",#-1,"JOESGAME":FORC=1TO31:
PRINT#-1,LO$(C);O$(C);O(C):NEXT:
FORC=1TO34:PRINT#-1,T(1,C);T(2,C
);T(3,C);T(4,C);T(5,C);T(6,C):NE
XT:PRINT#-1,L;M:CLOSE-1:GOSUB323
0:GOTO430
2460 IFQ$="DISK"THENOPEN"O",#1,"
JOESGAME":FORC=1TO31:WRITE#1,LO$
(C),O$(C),O(C):NEXT:FORC=1TO34:W
RITE#1,T(1,C),T(2,C),T(3,C),T(4,
C),T(5,C),T(6,C):NEXT:WRITE#1,L,
M:CLOSE1:GOSUB3230:GOTO430
2470 '  L O A D
2480 PRINT:Z$="I CAN LOAD AN ADV
ENTURE FROM 'TAPE' OR 'DISK'.":G
OSUB3010:PRINTZ$:Z1$=Z$:GOSUB310
0:Z$=""
2481 Z$="FROM WHICH DEVICE SHALL
 I LOAD AN ADVENTURE":GOSUB3010:
PRINTZ$;:Z1$=Z$:GOSUB3100:Z$="":
INPUTQ$
2490 IFQ$<>"TAPE"ANDQ$<>"DISK"TH
ENZ$="O.K. JOE. YOU MUST TYPE EI
THER 'TAPE' OR 'DISK'. I DID NOT
 LOAD AN ADVENTURE.":GOSUB3010:P
RINTZ$:Z1$=Z$:GOSUB3100:Z$="":GO
TO430
2500 IFQ$="TAPE"THENGOSUB3250:Z1
$="LOADING":PRINTZ1$:GOSUB3010:O
PEN"I",#-1,"JOESGAME":FORC=1TO31
:INPUT#-1,LO$(C),O$(C),O(C):NEXT
:FORC=1TO34:INPUT#-1,T(1,C),T(2,
C),T(3,C),T(4,C),T(5,C),T(6,C):N
EXT:INPUT#-1,L,M:CLOSE-1:GOSUB32
40:GOTO430
2510 IFQ$="DISK"THENOPEN"I",#1,"
```

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JOESGAME":FORC=1TO31:INPUT#1,LO$
(C),O$(C),O(C):NEXT:FORC=1TO34:I
NPUT#1,T(1,C),T(2,C),T(3,C),T(4,
C),T(5,C),T(6,C):NEXT:INPUT#1,L,
M:CLOSE1:GOSUB3240:GOTO430
2520 ' Q U I T
2530 Z$="ARE YOU SURE YOU WANT T
O QUIT [YES OR NO]?":GOSUB3010:P
RINTZ$;:Z1$=Z$:GOSUB3100:Z$="":I
NPUTQ$
2540 IF Q$<>"YES"AND Q$<>"NO"THE
NZ$="IF YOU ARE GOING TO FIND YO
UR SUCCESS, YOU WILL NEED TO LEA
RN TO ASK FOR EXACTLY WHAT YOU W
ANT.":GOSUB3010:PRINTZ$:Z1$=Z$:G
OSUB3100:GOTO2530
2550 IF Q$="YES"THEN END ELSE430
2560 ' H E L P
2570 IF L=1THENZ$="A VOICE IN YO
UR HEAD SEEMS TO SAY, TO THE SOU
TH IS HEART BREAK AND TO THE NOR
TH DESTINY. WHEN ALL SEEMS LOST,
 LOOK TO BE WELCOMED.":GOSUB3010
:GOTO430
2580 Z$="YOU WILL LEARN MORE BY
USING YOUR OWN JUDGEMENT AND NOT
 THE JUDGEMENT OF OTHERS.":GOSUB
3010:GOTO430
2590 '
2600 Z$="IN ORDER TO 'OPEN' OR '
CLOSE' THE PANEL, YOU WILL NEED
TO ENTER THE COMBINATION AS A SE
RIES OF NUMBERS.":GOSUB3010:Z1$=
Z$:GOSUB3100:PRINTZ$:Z1$="the co
mbination please":PRINTZ1$;:GOSU
B3100:INPUTA2$
2610 IF(L=7OR L=8)AND T(3,7)<0AN
D A2$="963147"THENZ$="THE PANEL
SLIDES OPEN.":T(3,7)=8:T(4,8)=7:
GOSUB3010:GOTO2700
2620 IF(L=7OR L=8)AND T(3,7)>0AN
D A2$="963147"THENZ$="THE PANEL
SLIDES SHUT.":T(3,7)=-3:T(4,8)=-
3:GOSUB3010:GOTO2700
2630 IF(L=29OR L=30)AND T(3,29)<
0AND A2$="2468"THENZ$="THE PANEL
 SLIDES OPEN.":T(3,29)=30:T(4,30
)=29:GOSUB3010:GOTO2700
2640 IF(L=29OR L=30)AND T(3,29)>
0THENZ$="THE PANEL SLIDES SHUT."
:T(3,29)=-3:T(4,30)=-3:GOSUB3010
:GOTO2700
2650 Z$="THAT IS NOT THE CORRECT
 COMBINATION.":GOSUB3010
2660 IF(L=7OR L=8)AND O(1)=1000T
HENZ$="THE CORRECT COMBINATION I
S AT ARMS LENGTH.":GOSUB3010
2670 IF(L=7OR L=8)AND O(1)<1000T
HENZ$="PERHAPS YOU SHOULD SEARCH
 THE MANSION FOR THE CORRECT COM
BINATION.":GOSUB3010
2680 IF(L=29OR L=30)AND O(2)=100
0THENZ$="THE CORRECT COMBINATION
 IS CLOSER TO YOUR HEART THAN YO
U THINK.":GOSUB3010
2690 IF(L=29OR L=30)AND O(2)<100
0THENZ$="YOU MIGHT DO BETTER TO
SEARCH THE MANSION FOR THE COMBI
NATION.":GOSUB3010
2700 RETURN
2710 '
2720 CLS:Z$="YOU SHOULD TRY AGAI
N SOME OTHER TIME. YOU DID NOT F
IND THE 13 SCROLLS. THE TOWNS PE
OPLE ARE ALL LAUGHING AT YOU.":G
OSUB3010:PRINTZ$:Z1$=Z$:GOSUB310
0
2730 Z$="IF YOU DESIRE SUCCESS B
AD ENOUGH, YOU WILL DISREGARD TH
E  LAUGHTER OF THE TOWNS PEOPLE
AND TRY AGAIN.":GOSUB3010:PRINTZ
$:Z1$=Z$:GOSUB3100
2740 PRINT:Z$="PLAY AGAIN [YES/N
O]?":GOSUB3010:INPUTZ$
2750 IF Z$<>"YES"AND Z$<>"NO"THE
NZ$="PLEASE TYPE 'YES' OR 'NO'."
:GOSUB3010:GOTO2740
2760 IF Z$="YES"THEN RUN ELSE EN
D
2770 CLS:Z$="YOU HAVE FOUND ALL
13 SCROLLS.YOU ARE WELL ON YOUR
WAY TO YOUR SUCCESS.":GOSUB3010:
PRINTZ$:Z1$=Z$:GOSUB3100
2780 Z$="THE TOWNS PEOPLE BEGIN
TO ASK TO SEE THE SCROLLS THAT Y
OU HAD THE COURAGE TO GET.":GOSU
B3010:PRINTZ$:Z1$=Z$:GOSUB3100
2790 Z$=INKEY$:IF Z$=""THEN2790E
LSE END
2800 ' DATA STATEMENTS
2810 DATA ON THE FRONT PORCH OF
SUCCESS MANSION.,IN THE MANSION'
S LARGE LIBRARY.,IN THE FOYER AT
 THE MANSION'S ENTRANCE.,IN THE
DOWNSTAIRS LAVATORY.,IN A LARGE
GAME ROOM.
2820 DATA AT THE SOUTH END OF A
LONG HALLWAY EXTENDING NORTH AND
 SOUTH.,IN THE OFFICE WHERE BIG
MONEY DEALS WERE ONCE CLOSED.,IN
 A LARGE VAULT WHERE VALUABLES A
RE KEPT.,ON THE LANDING HALF OF
THE WAY UP THE STAIRCASE.
2830 DATA AT THE FOOT OF A BEAUT
IFUL MARBLE STAIRCASE LEADING UP
WARD.
2840 DATA IN THE MIDDLE OF A LON
G HALLWAY EXTENDING NORTH AND SO
```

```
UTH.,AT THE SOUTHERN END OF A LA
RGE LIVING ROOM.,ON A MARBLE STA
IRCASE LEADING UP FROM A SMALL L
ANDING.,IN THE MANSION'S LARGE S
TUDY.,AT THE NORTH END OF A LONG
 HALLWAY LEADING SOUTH.
2850 DATA AT THE NORTH END OF TH
E LIVING ROOM.,AT THE WESTERN EN
D OF A LARGE DINING ROOM.
2860 DATA IN THE MIDDLE OF A LAR
GE DINING ROOM.,AT THE EAST END
OF A LARGE DINING ROOM.,IN A LAR
GE KITCHEN.,IN A SMALL LAUNDRY R
OOM.,IN THE KITCHEN PANTRY.,ON T
HE PRIVATE BALCONY.,IN THE MASTE
R BATHROOM.
2870 DATA IN THE GUEST BEDROOM.,
IN THE GUEST BATHROOM.,IN A LARG
E BEDROOM.
2880 DATA IN THE BATHROOM WHICH
ADJOINS TWO BEDROOMS.,IN THE PRI
VATE STUDY.,IN THE MASTER BEDROO
M.,AT THE EAST END OF A LONG BAL
CONY.,AT THE TOP OF A STAIRCASE.
,AT THE WEST END OF A LONG BALCO
NY.,IN A SMALL BEDROOM.
2890 DATA WRINKLED PIECE OF PAPE
R,PAPER,-2,PLASTIC ID CARD,CARD,
-2,KEY1,KEY1,-1,KEY2,KEY2,30,KEY
3,KEY3,28,KEY4,KEY4,20,LARGE OAK
 DESK,*,7,LARGE WALNUT DESK,*,29
,METAL DESK,*,14
2900 DATA CHINA HUTCH,*,17,LARGE
 OAK TABLE,*,18,HANDCARVED BOOKS
HELF,*,2,STATUE OF CUPID,*,10,PL
USH DESIGNER JACKET,JACKET,21,SM
ALL BOOKLET,BOOKLET,22,PAPERBACK
 BOOK,BOOK,-4
2910 DATA SMALL PAMPHLET,PAMPHLE
T,-1,DESIGNER WELCOME MAT,*,1,SC
ROLL13,SCROLL13,-3,SCROLL1,SCROL
L1,9,SCROLL2,SCROLL2,-1,SCROLL3,
SCROLL3,-1,SCROLL4,SCROLL4,8,SCR
OLL5,SCROLL5,30,SCROLL6,SCROLL6,
8,SCROLL7,SCROLL7,-1
2920 DATA SCROLL8,SCROLL8,-1,SCR
OLL9,SCROLL9,-1,SCROLL10,SCROLL1
0,-1,SCROLL11,SCROLL11,-1,SCROLL
12,SCROLL12,2
2930 DATA -2,1000,,,,,,,3,,,,6,-
2,4,2,,,,,,3,,,,,6,,,
2940 DATA 11,3,-2,5,,,,,-3,-2,,,
,,,-3,,,,,,,,13,10,,,11,,9,
2950 DATA 15,6,12,10,,,16,,,11,,
,,,,,32,9,,,-2,,,,17,11,16,-2,,
2960 DATA 18,12,,15,,,,15,18,,,,
,16,19,17,,,,,20,18,,,22,,21,19,
,
2970 DATA ,,,20,,,,,20,,,,,,29,,,
,,,30,,,,,,31,26,,,
2980 DATA ,,,25,,,,33,28,,,,,34,
,27,,,23,,-3,,,,24,,-2,-3,,
2990 DATA 25,,32,-2,,,,,33,31,,1
3,27,,34,32,,,28,,,33,,
3000 DATA INVENTORY,1,LOOK,2,EXA
MINE,2,READ,2,GO,3,RUN,3,WALK,3,
GET,4,TAKE,4,MOVE,5,PUSH,5,PULL,
5,UNLOCK,6,LOCK,7,OPEN,8,CLOSE,9
,DROP,10,PUT,10,SAVE,11,LOAD,12,
QUIT,13,HELP,14
3010 CX$=CHR$(32):LL=32
3020 CL=INT(LEN(Z$)/LL):CR$=RIGH
T$(Z$,CL)
3030 IF LEN(Z$)<=LL THEN PRINTZ$
:Z$="":GOTO3090
3040 FOR CX=LL TO 1 STEP-1
3050 IF MID$(Z$,CX,1)=CX$ THEN C
C=CX:GOTO3070
3060 NEXT:GOTO3070
3070 PRINT LEFT$(Z$,CC-1):Z1$=LE
FT$(Z$,CC-1):GOSUB3100:Z$=MID$(Z
$,CC+1,LEN(Z$)-CC)
3080 IF LEN(Z$)>LL THENGOTO3040
3090 RETURN
3100 IF TK=0THEN RETURN ELSEX=&H
FF00:Y=&HFF7E
3110 POKE X+1,52:POKE X+3,63
3120 REM
3130 POKE X+35,60
3140 GOSUB3160
3150 RETURN
3160 Z1$=Z1$+" ":FOR I=1TOLEN(Z1
$)
3170 IF PEEK(Y)AND128=0THEN3170
3180 POKE Y,ASC(MID$(Z1$,I,1))
3190 NEXT I
3200 IF PEEK(Y)AND128=0THEN3200
3210 POKE Y,13
3220 FORZ=1TO1800:NEXT:RETURN
3230 Z$="THE ADVENTURE HAS BEEN
SAVED.":GOSUB3010:Z1$="":RETURN
3240 Z$="THE ADVENTURE HAS BEEN
LOADED.":GOSUB3010:Z1$="":RETURN
3250 Z$="I WILL TURN ON THE MOTO
R TO THE TAPE RECORDER.  POSITIO
N THE TAPE WHERE YOU WANT, THEN
PRESS ANY KEY TO TURN OFF THE TA
PE RECORDER.":GOSUB3010:PRINTZ$:
Z1$=Z$:GOSUB3100:Z$="":FORZ=1TO1
000:NEXT:MOTORON
3260 Q$=INKEY$:IFQ$=""THEN3260EL
SEMOTOROFF:Z1$="PRESS ANY KEY TO
 CONTINUE.":PRINT:PRINTZ1$:GOSUB
3100
3270 Q$=INKEY$:IFQ$=""THEN3270EL
SERETURN
```

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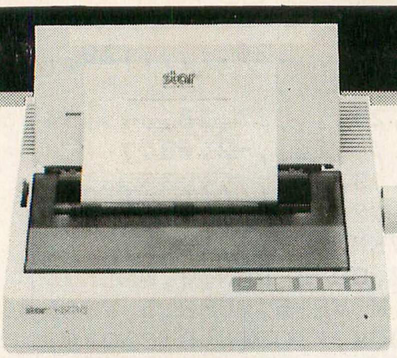

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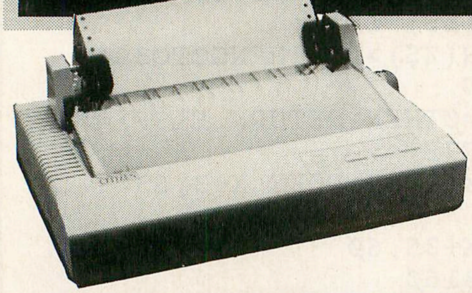

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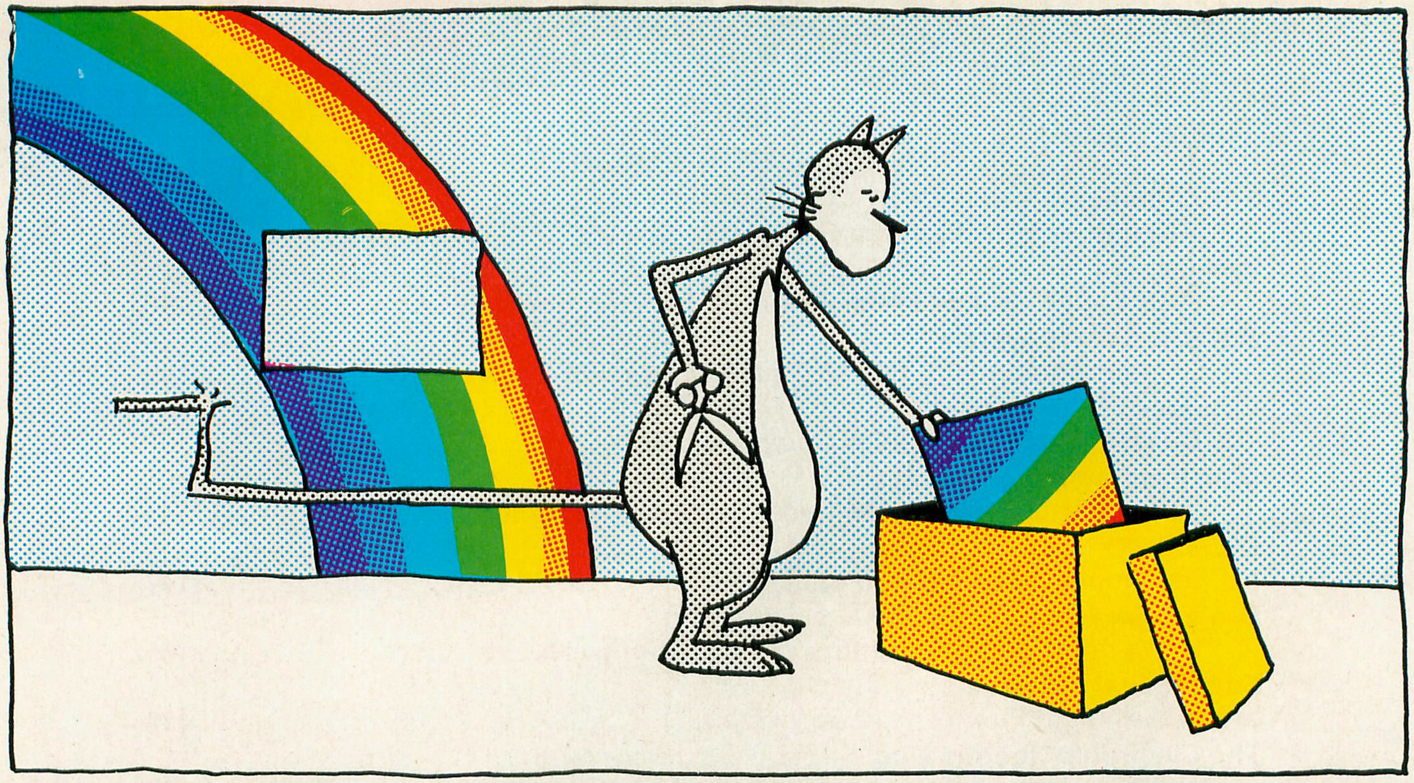

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REVIEWING REVIEWS

Bowling League Secretary

Editor:

I would like to take this opportunity to thank reviewer Donald Dollberg for the thorough and favorable review of my first commercial software venture, *Bowling League Secretary* (September 1986, Page 141).

I would also like to address the question he raised of the omission from the reports of a final tally sheet for each player. During program development, I had originally planned to include this report. However, in the attempt to keep everything within the capabilities of a 32K CoCo and one disk drive system (what most people seem to have), the storage requirements for this data precluded its inclusion in Version 1.0. A weekly report is, however, generated that includes the required data, i.e., the season's high average, game and series as well as total pins and games for each player. This can be entered into the individual's tally sheet.

In Version 1.0, I attempted to maximize the number of bowlers that could be accommodated, since I had no idea what size leagues would be attracted to this program. The program can presently handle over 200 bowlers' statistics; even more by reserving more buffer memory and string storage space in some of the sorting programs.

If user interest shows that the smaller leagues want this feature, I will try to add it to the one-disk version for a limited number of requirements for both reports and number of bowlers.

I am now working on a version with full reporting capabilities but, at present, it looks like a two-drive system will be required.

Incidently, I am about to release Version 1.1 which is designed for mixed leagues and keeps separate statistics for men and women. The same storage limitation applies to this new version, so this first release will be for a one-drive system.

I would like to thank RAINBOW for the excellent magazine, and for the interest and encouragement given new software suppliers by way of "Received and Certified." This gives the sincere newcomer a chance to get started in the CoCo world. Again, thanks for your coverage of the CoCo and keep up the good work.

Tom Barnett
*TOMELA*CO*

Try-O-Tax

Editor:

I have been using *Try-O-Tax* (available from Try-O-Byte, 1008 Alton Circle, Florence, SC 29501; 803-662-9500) for two tax seasons. I use it primarily to check returns prepared by other members of the firm. To date, I have processed more than 200 income tax returns using *Try-O-Tax*. I am well satisfied with the application. I have read comments from others that the program is very slow. In fact, the program is just as fast as your printer. My printer operates at 9600 baud and prints (draft) at 140 cps. In such an environment, the program operates faster than I can enter data. The program is actually a series of programs for the various forms, which are accessed by a main menu. The program is written in BASIC, which allows one to alter it. For example, earlier versions automatically rounded to the nearest dollar. In our firm, all of the tax practicioners use dollars and cents; it was a simple matter to alter the program to accommodate that.

I have just received the 1986 version of *Try-O-Tax*. The new version contains some very substantial enhancements. The system now completes Schedules A, B, C, D, E, F, G (income averaging), SE (self-employment tax) and W (deduction for married couples working), and Forms 1040, 2106 (employee business expense), 2441 (child care credit) and 6252 (installment sale). Further, Tax Schedules X, Y and Z are incorporated in the program. Thus, in doing Schedule G, there is no need to look up tax rates, and for incomes over $50,000, the tax is figured automatically. (For incomes below $50,000, you still have to look up the tax in the tax tables.) Further, there is a provision for selecting the baud rate of output and an automatic form feed, both of which save considerable time. Also, the new version uses dollars and cents in the output. The outprint format has been improved immensely; with some printers it comes very close to meeting the IRS' requirements for computer-produced facsimile forms. However, the author cautions that all offices may not accept these and advises attaching the printouts to the standard forms, particularly if you are expecting a large refund. The disk also contains the 1986 Tax Estimator, which was reviewed earlier in RAINBOW. Further, the documentation is greatly improved. This application is also available for Radio Shack models III and 4.

In summary, I was pleased with *Try-O-Tax* over the past two years, but the new version is a program of professional quality at a very reasonable price for a reasonably priced computer — a rare value. Also, it has been my experience over the years that the author is always ready and eager to help if you have a problem. The programs are unprotected and written in BASIC, so if one does encounter a problem, it can easily be resolved with a phone call to the author. I have not had time to extensively test the programs, but have spent some time running them all and have encountered no problems.

James N. Brown III
Medina, OH

PenPal

Editor:

I received my November RAINBOW today, and as is my usual habit, promptly sat down and read it cover to cover. I was rather disturbed when I came to Graham Langford's letter in Reviewing Reviews on Page 131. My experience with Four Star Software in general, and *PenPal* in particular, seems to have been just the opposite of Graham's.

I first ordered *PenPal* shortly after its release. I did experience problems in that I could not get the program to load in my 64K CoCo 2. After a couple of telephone calls to Four Star, during which they were most understanding and helpful, they explained to me that my problem was being caused by the copy protection used on Version 1.0. They promised that the problem would be corrected in Version 2.0, and that I would be sent a copy as soon as it was ready for release.

As promised, I received Version 2.0 last spring and began using it with no problem whatsoever. To my surprise, a few weeks later Version 2.1 appeared in my mailbox. With it came a letter explaining that a bug had been found in 2.0, and had been fixed in 2.1. I was not even aware of the bug in 2.0!

I have been using and thoroughly enjoying *PenPal* ever since. It has replaced *TW-64* as my word processor of choice (I am using it now to write this letter), and the communications program is fantastic for the CoCo SIG on Delphi! I am sorry that Graham has had problems with *PenPal*, but obviously not everybody else has encountered these problems.

Leonard K. Hult
Dallas, TX

TX-Word Processor

Editor:

A bug has been located in *TX* Version 03.07.1. When typing the Descriptor line, *TX* attempts to perform a word-carry if you type past the end of the line. A word-carry from the Descriptor line (67) will crash *TX*.

Fixing the bug is very easy. Load *TX* Version 03.07.1 into your CoCo and edit Line 69 as shown below:

```
69 IFMID$(T$(R),RM,1)=H$ORR
>65THEN38ELSEFORF=RM TORM-20
STEP-1:IFMID$(T$(R),F,1)><H$T
HENNEXT:GOTO38ELSEB=F:F=RM-20
:NEXT:IFMID$(T$(R+1),5,87-B)>
<STRING$(87-B,H$)THEN72
```

Save the repaired program. That's it. The bug is gone.

Fred Kolesar B/S
Westfield, PA

RECEIVED & CERTIFIED

The following products have recently been received by THE RAINBOW, *examined by our magazine staff and approved for the* Rainbow Seal of Certification, *your assurance that we have seen the product and have ascertained that it is what it purports to be.*

This month the Seal of Certification *has been issued to:*

Checkers-32K, a computer version of the popular board game. Challenging play for players with varied skill levels. *Applied Machine Intelligence, P.O. Box 358, Salida, CO 81201; $3.95 plus $.85 S/H.*

Chess-32K, for the Color Computer. Compete against the CoCo with this Hi-Res assembly language game. Features six skill levels with strong play and fast responses. *Applied Machine Intelligence, P.O. Box 358, Salida, CO 81201; $5.95 plus $.85 S/H.*

CoCo III Secrets Revealed, a book filled with useful information and powerful secrets to help you utilize the new features of the Color Computer 3. *Spectrum Projects, Inc., P.O. Box 264, Howard Beach, NY 11414; (718) 835-1344, $16.95 plus $3 S/H.*

Disk Minizap, a 32K BASIC disk utility program that allows the user to alphabetize a directory, save a backup directory, print a directory and edit sectors of the disk. *Drayon Software, P.O. Box 2516, Renton, WA 98056; (206) 255-8562, disk only, $6.*

Quotes, a 32K game for the CoCo that simulates the famous television show, *Wheel of Fortune*. Compete with your friends for points, not cash (up to eight players). *B. Erickson Software, P.O. Box 11099, Chicago, IL 60611; (312) 276-9712, $25.*

Speak-Easy, a speech synthesizer for the Color Computer. Features include a serial interface for use with the disk drive. No programming of words, just simple commands initiate speech. This device plugs into the printer port of the CoCo and appears as a printer to the CoCo. *Fazer Electronics, Inc., 539 McDaniel Mill Road, Conyers, GA 30207; (404) 929-1657, $149.*

CoCo III 512K Board, for the Color Computer 3. Easy to install. Includes 16 prime 256K DRAM chips. The board can also be purchased without the 256K DRAM chips. Compatible with OS-9 Level 2 and Multi-View. *Spectrum Projects, Inc., P.O. Box 264, Howard Beach, NY 11414; (718) 835-1344, $139.95 (with chips) or $99.95 (without chips) plus $3 S/H.*

Teacher Pak II, a collection of four 16K ECB programs for teachers. *Teacher Pak Plus*, a powerful 32K test-making program, is also included. *Tothian Software, Inc., Box 663, Rimersburg, PA 16248; (814) 473-3887, $47.95.*

TRY-O-TAX, is directed to the individual taxpayer and provides a convenient and economical way to remove some of the confusion and hassle associated with federal income tax preparation. *Try-O-Byte, 10008 Alton Circle, Florence, SC 29501; (803) 662-9500, $39.99 plus $3 S/H.*

VIP Writer Enhancer, designed for people who take files from *VIP Writer* and use them in another context, like uploading them to a BBS. It is also useful for downloading files from another word processor and changing them for use with *VIP Writer*. *Spectrum Projects, Inc., P.O. Box 264, Howard Beach, NY 11414; (718) 835-1344, $19.95 plus $3 S/H.*

The Word Factory Word Meanings, a 64K educational game for the CoCo. This is a three-program package for the teacher, the parent and the student. For the student, an entertaining game that helps build a better vocabulary. The teacher and parent are provided with a program to build new word lists. And, for the teacher, a program that generates test sheets for the classroom. *SECA, P.O. Box 3134, Gulfport, MS 39505; (601) 832-8236, $24.98.*

The *Seal of Certification* program is open to all manufacturers of products for the Tandy Color Computer, regardless of whether they advertise in THE RAINBOW.

By awarding a *Seal*, the magazine certifies the product does *exist* — that we have examined it and have a sample copy — but this *does not* constitute any guarantee of satisfaction. As soon as possible, these hardware or software items will be forwarded to THE RAINBOW reviewers for evaluation.

— Judi Hutchinson

Computer Island Educational Software

PROGRAM TITLE	GRADES	MEMORY	PRICE
PRESCHOOL			
Preschool I - counting	Pre-K	16K-Ext.	11.95
Preschool II - adding	Pre-K	16K-Ext.	11.95
Preschool III - alphabet	Pre-K	16K-Ext.	11.95
Music Marvel-play songs	Pre-K, 1	16K-Ext.	11.95
Arrow Games-6 games	Pre-K, 1	32K-Ext.	21.95
First Games-6 games	Pre-K, 1	32K-Ext.	24.95
Mr. Cocohead-facemaker	K-3	16K-Ext.	16.95
LANGUAGE ARTS			
Beyond Words 1-3 parts	3-5	32K-Ext.	19.95
Beyond Words 2-3 parts	6-8	32K-Ext.	19.95
Beyond Words 3-3 parts	9-12	32K-Ext.	19.95
Vocabulary 1-1000 words	3-5	32K-Ext.	19.95
Vocabulary 2-1000 words	6-8	32K-Ext.	19.95
Vocabulary 3-1000 words	9-12	32K-Ext.	19.95
Context Clues	4,5,6 or 7	16K-Ext.	17.95
Reading Aids - 4 parts	2-4	16K-Ext.	19.95
King Arthur-writing tool	2-6	16/32 Ext.	29.95
Cocowheel of Fortune	4-up	32K-Ext.	19.95
Context Clues	2-3	32K-Ext.	19.95
CLOZE Stories	3,4,5,6 or 7	32K-Ext.	19.95
Locating Story Details	2-3 or 4-5	32K-disk	24.95
Drawing Conclusions	3-4 or 5-6	32K-Ext.	19.95
Punctuation Practice	3-7	32K-Ext.	19.95
FOREIGN LANGUAGES			
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French Baseball-500 wds.	4-up	32K-Ext.	19.95
Spanish Baseball-200 wds.	4-up	16K-Ext.	11.95
Spanish Baseball-500 wds.	4-up	32K-Ext.	19.95
Hebrew Alphabet	beginners	16K-Ext.	11.95
Hebrew Utility	drawing utility	16K-Ext.	15.95
CRITICAL THINKING PROBLEMS			
Find The Math Sequence	4-up	32K-Ext.	19.95
Stranded-graphic advent.	4-up	32K-disk	24.95
TEACHER/STUDENT AIDS			
Colorgrade-gradebook	Adult	32K-disk	29.95
Quizmaker-write quizzes	5-up	32K-Ext.	24.95
ETT typing tutor (CocoWarehouse)	4-up	16K-Ext.	21.95

Disk indicates available on disk only.
Tape prices given.
Add $5.00 for any program on disk.

PROGRAM TITLE	GRADES	MEMORY	PRICE
MATH			
Opening a Bank Account	4-7	32K-disk	24.95
Dollars & Sense	2-4	16K-Ext.	14.95
McCoco's Menu	3-5	16K-Ext.	14.95
Moneypak	2-5	32K-Ext.	24.95
Graph Tutor	3-7	32K-Ext.	19.95
Graph-It	7-up	16K-Ext.	14.95
Math Invaders	1-8	16K-Ext.	17.95
Mathquiz-4 operations	2-5	32K-Ext.	19.95
Addition & Subtraction	2-3	16K	11.95
Skill Tutor Series			
Division Tutor	3-7	16K-Ext.	14.95
Multiplication Tutor	3-7	16K-Ext.	14.95
Factors Tutor	5-8	16K-Ext.	19.95
Fractions Tutors (3 programs)			
addition, subtraction or multiplication	4-8	16K-Ext.	19.95 ea.
Trigonometry	8-10	32K-Ext.	24.95
Equations Linear	7-9	32K-Ext.	19.95
Equations Quadratic	8-11	32K-Ext.	19.95
Arith. Diagnostic Disk	3-8	32K-disk	49.95
Fraction Diagnostic Disk	4-9	32K-disk	49.95
Verbal Problems Series			
Distance Problems	5-8	32K-Ext.	19.95
Area & Perimeter	5-8	32K-Ext.	19.95
Pizza Game	3-5	32K-Ext.	19.95
Sales & Bargains	6-8	32K-Ext.	19.95
Comparison Shopping	4-7	32K-Ext.	19.95
Binary Dice Game	4-up	32K-Ext.	19.95
SOCIAL STUDIES			
Know Your States	5-up	32K-Ext.	19.95
History Game	5-up	32K-Ext.	14.95
States & Capitals	5-up	32K-Ext.	19.95
Explorers & Settlers	4-up	32K-Ext.	19.95
Famous American Women	6-up	32K-Ext.	19.95
Street Map Game	3-5	32K-Ext.	19.95
MISCELLANEOUS			
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Science Game	8-up	32K-disk	29.95
Computer Literacy	6-up	32K-Ext.	19.95
5 Educational Programs with Lightpen	1-2 or 3-6	32K-disk	44.95
Chemistry Tutor	10-up	32K-disk	29.95

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Educational Software Makes Math Fun

Look. Listen. Learn. Three simple words, but when used in conjunction with the software available from Compass education, these words take on a new and deeper meaning.

This educational software is available on cassette tapes and is made to run on any CoCo that has at least 16K of memory. This software library consists of five main study courses which cover standard school curriculum. Each study course contains two volumes of material with eight cassettes in each volume for a total of 144 individual lessons.

The five main study courses are Developing Reading Comprehension, Rules of Writing, Math, Science/Physics and American History.

The first cassette in each volume contains the main loader used to run all of the lessons in that volume. As the loader is written in machine language, you will need to insert the cassette in your cassette player and rewind it. After you turn on your CoCo and monitor, all you will need to do is to type `CLOADM:EXEC:` and press ENTER. When the program is loaded and running, just follow the prompts on the screen.

When using these lesson plans, you can stop the program at any time by pressing the pause key on your cassette player. If you don't have a pause key, just stop the recorder. You can also rewind or fast forward the tape so that you can review or skip any section of the lesson plan.

I received the entire library, so over the next few months we will review each study course separately. This month we begin with Math.

The Math study course contains numbers, fractions and basic algebra.

As I mentioned earlier, there are two volumes in each lesson plan. In Lesson Plan One, Volume One starts with learning number digits and ends with different numbering systems. Volume Two starts with raising numbers to powers and ends with naming and defining fractions.

In Lesson Plan Two, Volume One starts with numerators and denominators of fractions, and ends with addition and subtraction of fractions. Volume Two starts with addition of mixed numbers and ends with using a ruler to measure fractions.

Lesson Plan Three, Volume One begins with the logic of algebra and ends with fractions and division. Volume Two starts with solving problems with equations and ends with equations and trigonometry.

These lesson plans are very well thought out, organized and presented. Each lesson plan starts out with the basic concept of that lesson and advances, cassette by cassette, to the more complex information provided by that lesson.

We were having a small family gathering on a football Sunday. My brother-in-law, Jerry, his wife, Julie (who are avid sports fans), and my niece Misty spent more time with CoCo and the algebra then they did watching the games.

Jerry couldn't stop raving about the program. He enjoyed it as a review of basic algebra. He told me that it has been a while since he got out of high school and he thought he had forgotten all of the algebra he had struggled through. Using this program brought it all back to him. He was impressed.

Misty is just starting junior high school this year and, although she hasn't been formally introduced to algebra, she still managed to enjoy this lesson plan. Misty summed it up very well when she said, "Uncle John, algebra is fun."

These programs are presented in such a way as to allow both adults and children to look, listen and learn. But most of all, to enjoy them.

To me, the main values of any type of educational software are the varying levels of difficulty, positive reinforcement, and whether or not it is user-friendly.

These programs certainly contain all of the preceeding requirements and, on a scale of one to 10, I would not hesitate to give the Math study course a 9.5.

(York 10 Software, 9525 Vassar Avenue, Chatsworth, CA 91311; 818-700-0330, $49.95 per volume plus $3 S/H)

— John A. Appel

Hint . . .

Topsy-Turvy

Many CoCo users encounter I/O Errors when loading programs from tape which were saved by a different CoCo. The most likely culprits are the volume setting and tape alignment. If you have tried various volume settings with no luck, try turning the tape recorder, with the cassette in place, upside-down on the table. This will change the way the tape travels across the playback head and may result in a "good" load of the program.

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```
10 INPUT A$
20 PRINT #-2,A$
30 GOTO 10
```

and imagine how you could upgrade your games and applications with simple printer statements to use Speak-Easy! It can say anything including foreign words. If you can spell it, Speak-Easy can say it!

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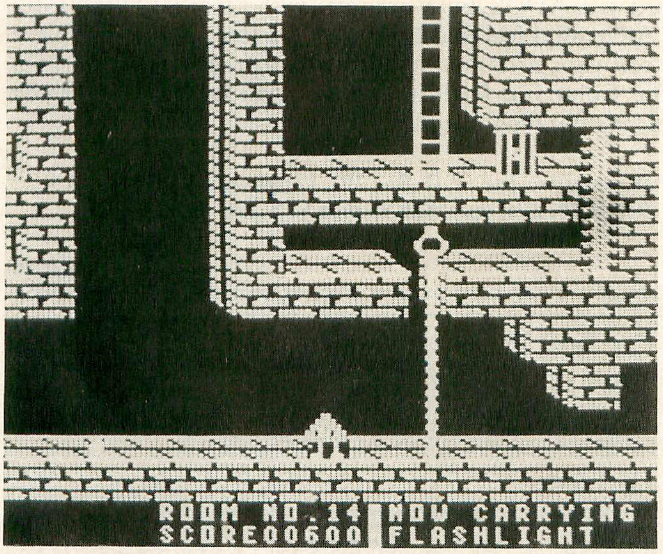
Delve Into the Delightful Depths of *Dragon Slayer*

Grab your sword, fellow game players, for you are about to proceed into the lair of the awful dragon to save the villagers of Pendor.

What's that? You say you're tired of searching for treasure, fighting monsters and, most of all, going after fire-breathing dragons? Ah, but don't despair, because from this time-worn saga Tom Mix Software has created a game of epic proportion that will delight many a Color Computer owner. And — even more good news — this game runs on the CoCo 3.

You see, in *Dragon Slayer*, you do not frantically mash the joystick button in an attempt to exterminate evil life forms. Nor do you madly pound on the keyboard in your quest to `HACK MONSTER`. Rather, you, a shortish cone-shaped fellow with two spindly legs, wander about a 10-level dungeon (with 16 rooms per level) moving objects to facilitate your quest for the aforementioned fire-breather.

Each room is depicted on the screen with walkways, ladders, ropes and other objects shown graphically. Using either the arrow keys or joystick, you move up and down ladders and ropes, gathering keys to unlock doors, wielding swords to crush enemies, donning boots for treks across dangerous turf, restoring downed bridges, maneuvering through darkened passageways and, of course, collecting the ubiquitous bags of money scattered throughout the dungeon. One press of the space bar allows you to pick up objects, but with the exception of money, only one object may be carried at a time.



Juggling objects and determining how to deal with traps and other tricks requires thought and strategy, not to mention exploration, and trial and error. This is especially true at higher levels where there are many, many obstacles, puzzles and assorted challenges. Solving this game is no easy matter, especially since you have only three "lives" with which to complete the task.

Dragon Slayer effectively meshes the visual aspects of an arcade game with the challenges and strategy of an Adventure game. The graphics are excellent. The animation is smooth and relatively flicker-free. Sound effects, though, could be improved.

When it comes to features, *Dragon Slayer* deserves a high rating. You can control your speed (or stop), pause the game and quit, or save the game after solving a level. I found a problem with the last feature. When I had solved Level 1, I pressed the S key as instructed to save my game position. However, the next time I loaded the game, it did not continue with Level 2 as the instructions said it would, but started all over at Level 1. I have talked with others who haven't had this problem, so perhaps it was a bug in the review copy.

All in all, *Dragon Slayer* is a game that provides countless hours of fun and challenge for practically everyone. The game, while designed for adults, is equally suitable for children, and could even help them learn basic puzzle solving. On a scale of one to five, *Dragon Slayer* gets a four.

Dragon Slayer expertly combines arcade action with strategy, exploration and challenging puzzles, making it easy to play but hard to master. Good graphics and 160 different rooms further enhance this game.

(Tom Mix Software, P.O. Box 201, Ada, MI 49301; 616-957-0444, disk $29.95 plus $3 S/H)

— Eric W. Tilenius

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The RAINBOW, June 1986

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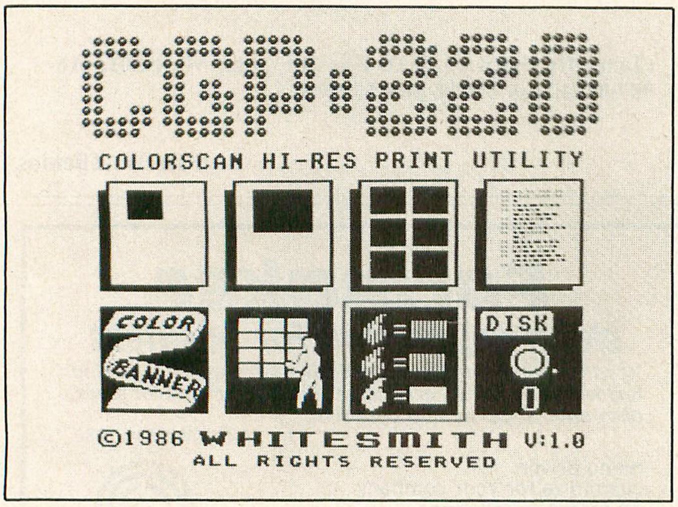
Colorscan Delivers Dazzling Results

So you bought a Radio Shack CGP-220 Color Ink-Jet Printer on sale . . . but you haven't been able to do much with it, since software for Tandy's most colorful printer was scarce. Have no fear! Computize, Inc., and the Whitesmith partnership (of *Graphicom II* and *Hardcopy* fame) have just what you're looking for.

Colorscan is more than just a screen dump program. One quick glance at the documentation has you up and running. The program greets you with simple instructions for making sure you get the correct colors on your screen. Next, you're whisked away to the icon-oriented main menu, where you can choose one of eight different "modules," or selections, by using either the keyboard or joystick. By selecting Disk, you can load or view any 6K (one screen) picture, specify which drives to use and change the baud rate.



The two "regular" screen dump modules allow you to create a ¼-page or ½-page printout, with an adjustable left-hand margin. Disk Dump lets you view 6K pictures on the selected disk or print them all out, two across on the paper, with just a flick of the wrist.

The Poster module creates multi-page printouts of either the entire picture or just part of it. You are told how long it will take, as well as how many sheets of paper. This feature also works to make a small printout of just a portion of the picture quickly.

Customizing the colors of your printout is done via the Custom Ink module. This lets you to determine whether the reds, blues, blacks and whites on the screen are printed just as they look, or maybe as violet, green, yellow and magenta, instead. Colors can be selected individually, and a test printout can be done, which gives a hard copy of the pokes needed to change the BASIC driver to default to these colors.

But wait, there's more! Rainbow-colored banners can be produced using the Banner module. Select four colors and one of the seven fonts that are included to make a banner up to 27 inches long. The estimated time is displayed for this feature, also.

And as if this weren't enough, *Colorscan* has a feature I've not seen anywhere else. This gives the capability to make a listing of any BASIC program, but with one important difference. You can have your line numbers printed in one color, program code in another, and remark statements in a third color. You're also allowed to specify four strings to be highlighted in your choice of colors as well. In addition, you may also have any multi-command lines separated in the listing. All this is a little slow, but the resulting printout is fascinating. Unlike other parts of the program, I was unable to find a way to break out once printing has started.

I also liked the fact that what this program says is violet, looks violet. If you go according to Ink-Jet's manual, what they say is violet, looks blue, and vice versa. I find this quite annoying, not to mention confusing. Whitesmith's decision to make this change was, in my opinion, a good move.

The first disk I received had a few garbled files, and some of the features did not function properly. After contacting Eric White, it was determined that I'd received an early production copy, and a new disk was rushed to my house. The second copy worked just fine. I found Mr. White and Computize to be as user friendly as their program.

There are only a few minuses that I can see with *Colorscan*. Documentation is minimal, and leaves a few things to your own discovery. For example, there is no explanation of how to exit the String Search (use the BREAK key), or the Banner Edit mode (the BREAK key again). The line numbers to change in the boot program for default colors aren't listed anywhere, (lines 710-740). If you view a BASIC program before listing it from the Color List module, make sure the printer is on, or the program hangs up. To exit the program use the reset button, or turn the computer off. Personally, I like to exit through the software. And while you are told that two-screen *CoCo Max* pictures can be loaded, you are not told to scroll the picture with the arrow keys. Also be aware that *Colorscan* cannot be used with ADOS, but works well with 1.0 or 1.1 Disk BASIC.

All in all, I feel that *Colorscan* is a fine, easy-to-use piece of software. So if you're looking for a program that can help your Color Ink-Jet Printer really strut its stuff, *Colorscan* delivers dazzling results!

(Computize, Inc., P.O. Box 207, Langhorne, PA 19047; 215-946-7260, disk only, $29.95 plus $3 S/H)

— Gay Crawford

One-Liner Contest Winner . . .

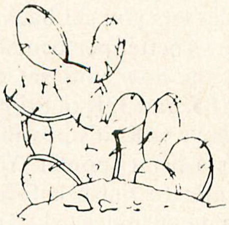
Run this program, *Grid*, and enter the spacing you desire by entering any number from 1 to 255. Try some fractional values for interesting effects.

The listing:

```
1 CLS:INPUT"ENTER GRID SIZE";X:P
MODE4,1:PCLS:SCREEN1,1:FORA=X TO
 255STEP X:LINE(A,0)-(A,192),PSE
T:LINE(0,A)-(255,A),PSET:NEXTA:L
INEINPUTA$:GOTO 1
```

Keith Biasillo
Indianapolis, IN

(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book of Simulations* and its companion *The Rainbow Simulations Tape*.)



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HALL OF THE KING requires 64K EB and one disk drive. This exciting two disk adventure comes packaged in a vinyl case. **$39.95.**

HALL OF THE KING II (Rainbow Review 9/86)

Continue your quest for the Earthstone in The Inner Chambers of the **HALL OF THE KING.** Outstanding graphics help show the way to success in your search to help restore the legendary power of the Earthstone to the dwarven race. The deeper you travel into the inner chambers, the more difficult your progress becomes. **HALL OF THE KING II** has all the fine features of the first adventure. It is designed to follow the original **HALL OF THE KING** but may be played as a stand-alone adventure. The adventure fills two disks and comes packaged in a handsome vinyl folder. It requires one disk drive and 64K. **$39.95**

WARP FACTOR X (Rainbow Review 2/86)

If you have been waiting for a game for your color computer that has everything, your wait is over. **WARP FACTOR X** is here. This all graphics simulation game requires strategy, fast thinking, an eye for detail, and above all experience in knowing the capabilities of your starship and its computer. (See review in Feb. 85 issue of Rainbow.) It requires 32K one disk drive and comes packaged in a vinyl library case. **$34.95**

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You and your comrades will explore the levels of Darkmoor Hold in an effort to gain great riches and defeat the dark wizard. The Wizard will soon realize the threat you pose and the many monsters you meet and battle will become stonger and more powerful as you move through the 10 levels of Darkmoor. A keen eye will help you find weapons and armor to aid your battle along with treasures for you to keep. Your party consists of a Dwarf, an Elf, and you, the Human, each with their own special attributes. The weapons, armor and treasure are placed randomly in each level to provide a new challenge each time you play. You may also save the game you are playing since defeating the evil Wizard is not an easy task. It has great graphics and an impressive text screen to give you more fun than a barrel of elves. Requires 64KEB and 1 disk drive. **$29.95**

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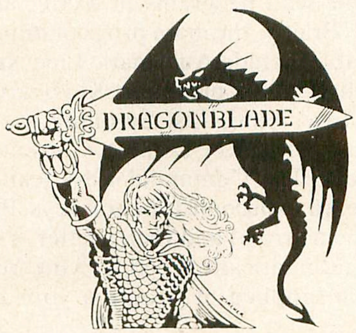

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This 100% hi-res graphics adventure features many animated screens which will delight the avid adventurer. You search for the magic Blade which is the only way to rid your homeland of the fearsome dragon which has risen from a long rest to terrorize your village. Fill your screen with super graphics as you try to solve the difficult challenge the village leaders have set before you. Dragon Blade requires 64K EB and 1 disk drive. **$29.95**

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Super Programming Aid Version 2 Is Better Than Ever

A great utility program has just gotten better! If you don't already own the *BASIC Programming Aid*, check out the review in the July 1986 RAINBOW. It was already a super program for anyone who programs in BASIC, and now it has been improved. Briefly, the main programming aids that were already available include Automatic Line Numbering, Auto-Load of a disk menu program, Keyboard Clicker, Suspend, Copy, Move, Find, List Scrolling, Key Repeat, Program Formatting, Clear Key Disable, Current Line Edit and Command Keys. The Command Keys feature allows keys on your keyboard to become function keys. By pressing the control key (down arrow) and then a letter, a command or a line of text is automatically typed for you. You can use the command table supplied or program your own command keys.

Version 1 works with 16K ECB or more, but doesn't take advantage of 64K. Version 2 has been designed to run with the 64K CoCo. It will not run on the 16K CoCo. Version 2 works with 32K, but the new print spooler will not work in this mode.

Version 2 allows you to configure the CoCo as an all-RAM machine. This gives the option of placing the *Programming Aid* in RAM that is not used by BASIC, Extended BASIC or Disk BASIC, and permits use of all the normal 32K of RAM for a BASIC program.

The addition of a print spooler lets you get back to work while listing a program and allows better performance from BASIC programs. Depending on how you set up your memory, you can have between 6K and 32K of print spooler available. For instance, if you have 64K, it's possible to use that "hidden" 32K of RAM as a print spooler. You never again need to wait for the printer to finish before getting back to work. You and the printer can now work at the same time. Running the spooler also gives you the option of cancelling output that has already been spooled.

Version 2 is configured to your system at startup time. The memory and command table options are easy to set. Prompts give you the opportunity to change any of the startup options to make it meet your programming needs any time you use it.

The manual is clear and detailed. Each function is fully explained and examples are given. Onscreen prompts, status messages and error messages keep you from getting lost or confused.

Bangert Software Systems has put all these options together in one compact machine language program. It can be used with either tape or disk based systems and works with any ROM version.

Anyone who programs in BASIC should have this program. After all, you deserve it.

(Bangert Software Systems, P.O. Box 21056, Indianapolis, IN 46221; 317-632-0174, $29.95)

— James Ventling

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A CoCo Nut's Best Friend: Spike, *The Electronic Robotic Dog*

This just has to be the ultimate science fair project! Imagine if you will, a CoCo-controlled robotic dog scampering around in front of your booth nipping at the heels of the judges!

The idea sounded hilarious to me when I first heard of it, but the folks at Electronic Motion Control have developed plans and software to actually accomplish this feat. In spite of the humorous setting I have depicted, the subject should not be taken lightly. The resultant robot built from the available plans is capable of some pretty neat tricks.

The plans consist of detailed drawings, diagrams and circuit board layouts, as well as a parts list of the hardware items needed. Besides a dedicated Color Computer 2 with ECB and 64K RAM, you also need various other circuit boards, motors and gear boxes. A list of where to buy these items is included in the package, many of which can be purchased from EMC.

A program is supplied on tape that allows you to program "Spike" to follow a specific pattern. As Spike runs the pattern he quickly learns his directions and runs it himself without any further training from his master. You program the initial pattern with the use of a joystick plugged into the CoCo. By the way, the computer is removed from its plastic case and installed directly onto Spike's chassis. Your TV or monitor is used during this initial programming process in order to see what you are doing. If you want, you can also hook up a printer and make a listing of the program with your unique pattern and other changes.

The CoCo 2 is modified to the extent of bypassing the AC power supply and using motorcycle batteries and charger for the power supply. Other minor CoCo logic board modifications are also required and detailed.

A clever option utilizing a Polaroid Sonic Board, like that used in the auto-focus instant camera, allows Spike to "see" obstructions and react accordingly. You can also add an optional speech synthesizer so that Spike can "speak," or maybe just bark.

In looking over the detailed, 41-page instruction booklet, it appeared that everything you need to know to build this robot is there. One should not take this project lightly, however. It requires a lot of sheet metal work and some machining as well as electronic savvy; definitely not a project for the novice. The finished product is well worth the effort and adds still another dimension to your Color Computing interests.

Although this represents a "fun" type project, it will not be a snap to build and train Spike; but unlike the real thing, this dog won't leave a mess on your living room floor!

(Electronic Motion Control Inc., P.O. Box 17271, Air Port Station, Clearwater, FL 33520; 813-536-1694, $69.50 plus $3 S/H)

— Jerry Semones

The RAINBOW

THE COLOR COMPUTER MONTHLY MAGAZINE

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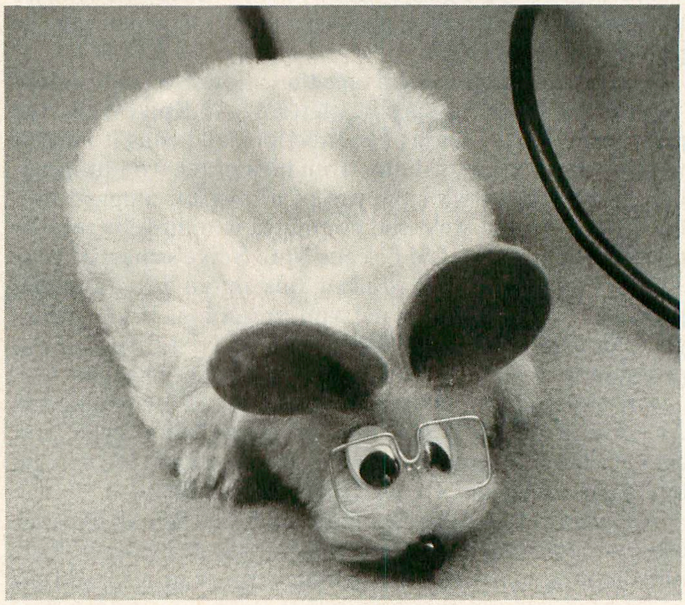
Remember the ads for *Jaws II* — "Just when you thought it was safe to go back in the water"?

Well, just when you think you've seen everything, it always comes along. And here it is: The MouseTop mouse cover.

You don't need this little cover that fits right over your computer mouse. Oh, certainly, it keeps the grime, dust and grit off the mouse. But I have honestly seen darn few people use keyboard, disk drive and (for that matter) typewriter covers. Too much trouble.

Those things don't have something that the MouseTop does — it's cute.

"What's that?" someone asked a few minutes after it arrived. "It's a mouse cover," I said. "It keeps my mouse clean and warm."



"It's *cute*," was the reply. "Really cute. At last, you have something cute to go with all that equipment."

OK. I've bought laser printers, 70-Meg hard drives, jazzy plotters and every computer Tandy's made in the past five years. Nothing has brought as much comment as this little MouseTop.

It *is* cute. Two ears, glasses and a shiny black nose. It fits right over my computer's mouse. The "tail" is the mouse cord.

Each MouseTop is hand-made, which makes each unique. And they are machine washable.

I like this little varmint and I think you'll like it, too. It does add a touch of furry personality to your computer.

(H&H Enterprises, P.O. Box 2672, Corona, CA 91718; 714-737-1376, $5.95, 20/20 vision model [without glasses] $5.49)

— Lonnie Falk

Miscellaneous Writings Enhances Bible Studies

The idea of a book or books on disk isn't new, so I will not make further comment on the concept, except to agree that it is a case of the future being the here and now.

The Rev. Mark Camp has used the idea to great advantage for Bible scholars, ministers or people just plain interested in the scriptures. I'm excited about that, but the whole concept of book disks has to be even more exciting!

Just think of a school having history books on disk that could be updated every year as history is being made. Use your imagination on this one; there are hundreds of applications.

As for *Miscellaneous Writings*, I put them to the test by using the outlines for a sermon and a couple of Bible studies. Nobody fell asleep and fell out the window, so they must have been effective.

Seriously, they were very good outlines that are easy to follow. I will reserve any review on doctrinal grounds for religious publications.

The text files print out well on *VIP Writer*, which has always been my workhorse word processor. They also print on *Telewriter-64* and with a text file printer included on the disk.

This is a superior program for Bible students, Sunday schools or folks interested in the Bible, but don't let that keep you non-biblical types from taking a look. It is a great concept.

The material on the disk is explained in `DISKINFO/TXT`, which tells you all about the files. Using the built-in word processor, or your own word processor program, you can read or print out the file you want. This is a superior way to obtain and store text. I would call this an inexpensive must for all Bible students and an interesting disk for everyone.

Also included in the review package was a collection of programs called *CoCo Hymnal II*.

This program was conceived out of necessity when Pastor Mark was caught on a night when his regular pianist was not available.

All he had around was his "Tandy Steinway" so he sat down and programmed some favorite hymns along with a text display of the words. It was well received by the congregation, and Pastor Mark expanded it using a couple of graphics programs to include some title pages and a menu.

The program operates by typing `RUN "FT.BAS"`, which prints out (onscreen) the instructions and sets a Hi-Res screen for the text printing.

You can choose Old and New Favorites, Songs About the Holy Spirit, Hymns of the Reformed Faith or Songs for Children. Each general area gives you several choices of hymns.

Mark modestly says the arrangements are not professional, but they sound like the mighty Wurlitzer to me. It is amazing how much music can come out of my old gray F-board CoCo.

My only problem with the *CoCo Hymnal* is the inability of the program to take you back to the menu after a set of selections has been played.

You can access another group if you run the basic program for that group, but that requires keeping the list handy, and you know how lazy we can get about things like that. I am sure Mark Camp is working on that program along with a lot of good stuff.

Sovereign Grace Software is filling an important function. I found both disks in the review package well worth the money and the time.

(Sovereign Grace Software, 221 Highview Drive, Ballwin, MO 63011; 314-227-3238, Writings Disk $9.95; CoCo Hymnal, by donation)

— Howard Lee Ball

One-Liner Contest Winner . . .

Just type it in and run it. This program is quite self-explanatory.

The listing:

```
0 CLS0:FORN=1TO100:C=RND(8):X=RN
D(32)-1:Y=RND(16)-1:SET(X,Y,C):S
ET(X,31-Y,C):SET(63-X,Y,C):SET(6
3-X,31-Y,C):IFRND(20)=3ORINKEY$<
>""THENRUNELSENEXT:RUN'LIGHT SHO
W
```

Stevie D. Pritchett
Jacksonville, AL

(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book of Simulations* and its companion *The Rainbow Simulations Tape*.)

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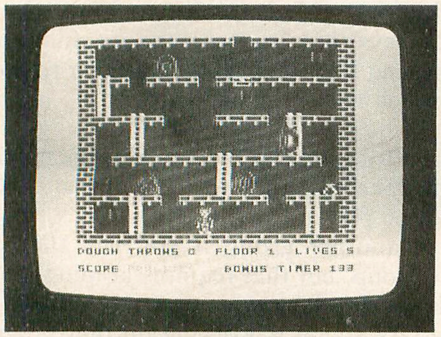
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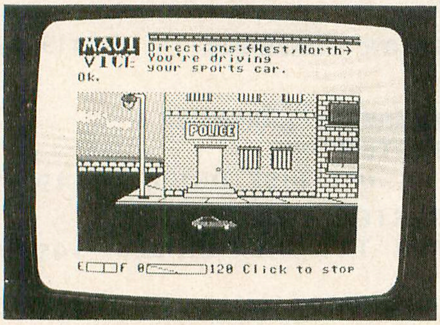
MAUI VICE
Directions:<West,North>
You're driving
your sports car.
Ok.
POLICE
F 0 120 Click to stop

Maui Vice

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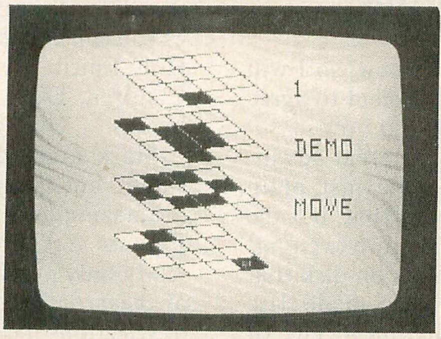

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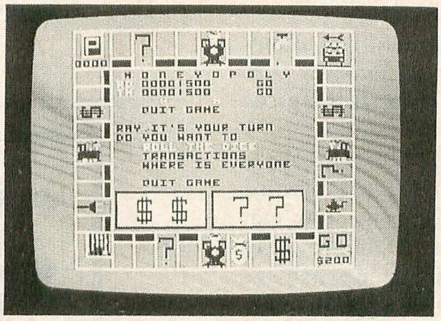
MONEYOPOLY
00001500 GO
00001500 GO
QUIT GAME
RAY, IT'S YOUR TURN
DO YOU WANT TO
TRANSACTIONS
WHERE IS EVERYONE
QUIT GAME
$ $? ?
GO
$200

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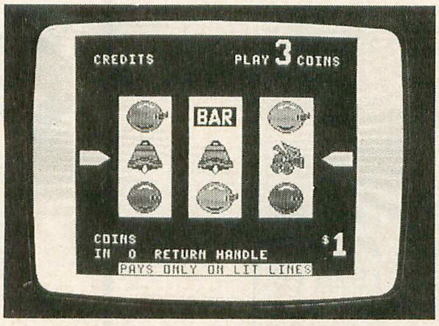
CREDITS
PLAY 3 COINS
BAR
COINS IN 0
RETURN HANDLE
$1
PAYS ONLY ON LIT LINES

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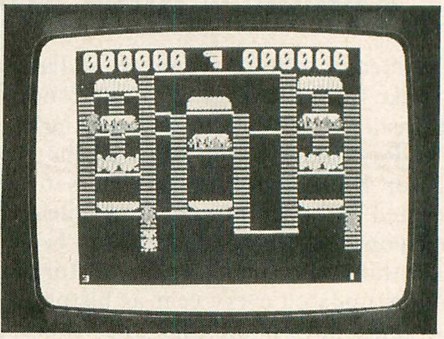
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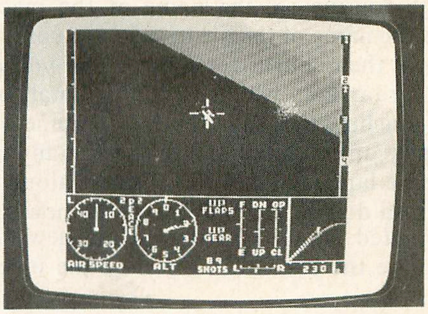

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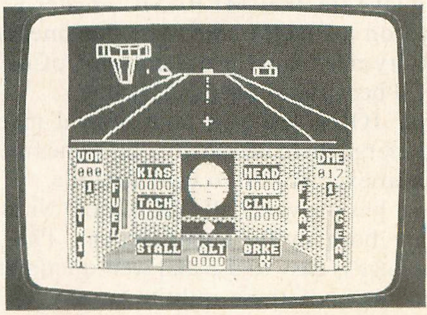
32K Machine Language
Flight Manual Included
Tape $29.95 Disk $34.95



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32K Machine Language
Flight Manual Included
Joysticks Required
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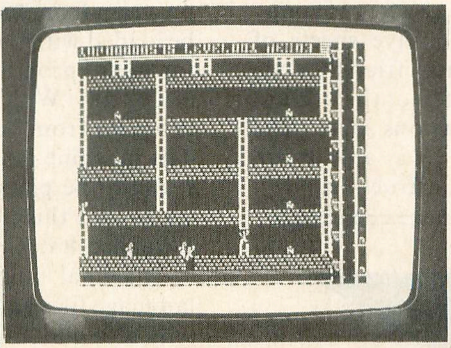

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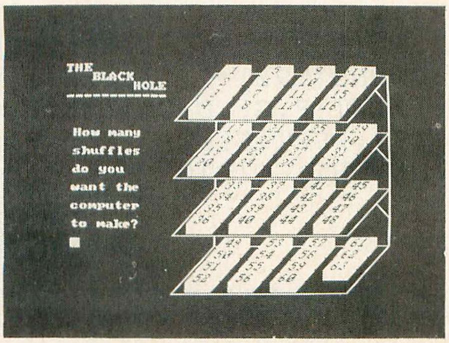

THE BLACK HOLE

How many shuffles do you want the computer to make?

NEW RELEASE
THE BLACK HOLE

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Disk Programming Package Provides Additional Security

From time to time everyone sits in front of his CoCo and thinks, "I sure wish someone would write a utility to do that. It would be so nice!" At least four of those wishes have now come true thanks to Bob van der Poel Software's *Disk Programming Package*.

The *Disk Programming Package* consists of four utilities that could be of use to all Disk BASIC programmers. The four utilities are ADDML, which appends machine language subroutines to your BASIC program; UNPACKER, which reverses the action of BASIC line packers; MLBASIC, which converts a BASIC program to a machine language file; and JOIN, which links several machine language routines into one file and optionally adds an autoexec feature.

The four utilities come on a single disk, which is not copy protected. The documentation consists of five sheets of typewritten instructions written in a chatty, friendly style that leads you through the operation of each of the utilties. The programs run exactly as the instructions state. The operation of the four utilities is so simple, I was able to run all of them without having to look at the instructions.

The ADDML utility is perhaps the most useful utility of the four. With it, you can take a BASIC program, code the slow parts in machine language, and then use the utility to combine the two into one file. When you run the utility, it asks you for the name of the BASIC program to add the machine language routine to, the name of the machine language file, and the name of the file to write the combined output to. The disk then churns for a while and you have a new BASIC program file, which is the original BASIC program and the machine language routine combined. The new BASIC program can be edited and re-saved many times because the machine language part now "rides" along with it in memory and on disk at the bottom of the new BASIC program. Also created is an extra line in the new BASIC program to calculate the execution offset of the machine language routine.

The UNPACKER utility is designed to reverse the effects of BASIC packer programs that delete spaces and create multi-statement lines when they can. Although a specific packer program is mentioned in the documentation, I found out that UNPACKER will take any BASIC program, packed or not, and create a new program with one statement per line and spaces between all the BASIC keywords.

MLBASIC is a fascinating utility. It converts a BASIC program from BASIC format to a format that can then only be loaded with the LOADM command. In addition, it encrypts the BASIC program and provides for protection against the BREAK key. With this utility, you can easily protect a BASIC program from being listed, edited or changed in any way. The machine language file that MLBASIC creates is fully ready to be placed on a PROM chip. The documentation states that this utility may cause problems on CoCos with Extended BASIC 1.0 because of the PCLEAR bug.

The final utility, JOIN, lets you take several machine language files and merge them all together into one file. You may also add an autoexec option to your new file.

Bob van der Poel has provided all CoCo users with a set of utilities that are both useful and practical. The *Disk Programming Package* is easy to use and well-documented. Dr. Megabyte recommends these utilities to anyone who may have a use for them.

(CMD Micro, 10447-124 Street, Edmonton, Alberta, Canada T5N 1R7; 403-488-7109, $14.95 plus $2 S/H)

— Mark E. Sunderlin

About The One-Liner Contest . . .

THE RAINBOW's One-Liner Contest has now been expanded to include programs of either one or two lines. This means a new dimension and new opportunity for those who have "really neat" programs that simply just won't fit in one line.

Here are the guidelines: The program must work in Extended BASIC, have only one or two line numbers and be entirely self-contained — no loading other programs, no calling ROM routines, no poked-in machine language code. The program has to run when typed in directly (since that's how our readers will use it). Make sure your line, or lines, aren't packed so tightly that the program won't list completely. Finally, any instructions needed should be *very* short.

Send your entry (preferably on cassette) to:

THE RAINBOW One-Liner Contest
P.O. Box 385
Prospect, KY 40059

One-Liner Contest Winner . . .

Type this one, but try to guess what it does before you run it.

The listing:

```
10 PMODE4,1:PCLS:SCREEN1,1:PMODE
3,1:FORPL=1TO33:D=RND(3)+1:F=RND
(256)-1:G=RND(192)-1:CIRCLE(F,G)
,11,D,1:PAINT(F,G),D,D:LINE(F,G+
8)-(F,G+18),PSET:NEXTPL:FOR HT=1
TO444*3:NEXTHT:GOTO10
```

John Beck
Suitland, MD

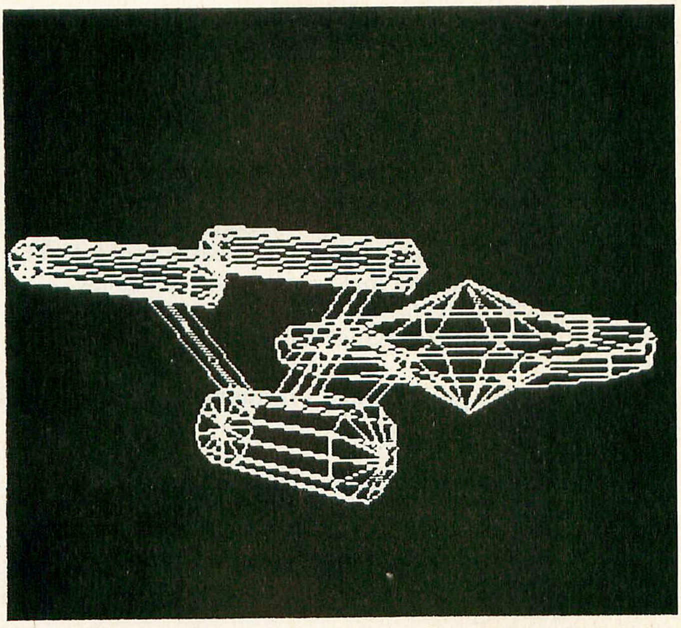
(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book of Simulations* and its companion *The Rainbow Simulations Tape*.)

You Can Have *3-D Graphics* Without the Glasses

As you may have noticed, one of the things the CoCo does best is graphics. Logicware has developed a program that makes CoCo shine in that regard, and with a flair.

This machine language program is available on tape or disk and needs 64K of RAM and Extended Color BASIC. It is not copy-protected so a backup copy is possible. A 29-page detailed set of instructions is well-done and full of examples on how to put the program through its paces.

3-D Graphics provides simultaneous rotation, movement, zoom and animation of 3-D graphics images. The images can be printed on most dot matrix printers; the program is specifically designed to work with Radio Shack printers.



Samples of what can be done with this software are provided. You can see a spaceship (*The Enterprise*), a cube, a sphere and a pyramid, all of which rotate and move about the screen to show every perspective.

Running the program is as simple as loading and executing THREED. You are prompted to enter a command. Pressing H provides a menu of options. A demonstration of 3-D with animation of the spaceship can be viewed.

A zero is used for the shortest possible delay time between successive graphics images. It provides very smooth rotation and alternate views of the spaceship. Increasing the value results in stop-action-type still shots. Exit the viewing mode by pressing the ENTER key.

A demonstration is also provided using a sphere, a cube and a pyramid. The unique thing about this demo is that not only are the objects rotating and moving on the screen, but the pyramid actually zooms from a small to a large size giving it the appearance of real 3-D as it moves toward the viewer. A pretty neat trick — and no 3-D glasses!

Some other unusual techniques are possible with this program. You can select a single view of any of the objects and make it as small or as large as you like.

It takes about 2½ minutes for the view to be completed, and it remains on the screen. While the picture is drawn on a black background, it can be inverted by pressing I and ENTER. At this point you can send the picture to the printer.

As you can see, the commands are very powerful and allow the programmer almost unlimited freedom in ways to view an object. Since the size of the object on the screen is proportional to the Scale Value, the objects size can be changed easily. The Standing Point of Observation Value (SPO) can also be changed for close-up or far away views. The X, Y and Z values of rotation and translation are extremely useful. The center of the screen represents a value of zero while positive values of X go to the right and negative values to the left. The Y values are positive going up and negative going down from the center. The Z values are positive coming toward the user (out of the screen) and negative going away from the user (into the screen). In a similar fashion, the X, Y and Z translations move the object off of center.

Also included is a program called Edit. This program is used to create your own 3-D graphics images. The user enters appropriate coordinates to create any image the imagination can dream up, although I found this part of the program to be a little user hostile. You have to resort to pencil and paper to create these images, since you are dealing with tri-axis information. While this is complex, it is not impossible and I suspect that many CoCo users will catch on quickly. I also feel that the Edit program is lacking in one important area. It needs a way to "see" what's going on. As it stands, you can't see the fruits of your labor without first saving the file and then looking at it with the THREED program. Another useful feature would be a disk command to allow the user to see the directory. A Dir option would be a real help since you wouldn't have to break out of the program to see the filenames you couldn't remember or forgot to write down.

In spite of these shortcomings, *3-D Graphics* is a powerful program that allows talented programmers to create some very interesting 3-D images. The authors, Robert Steidl and Johnathan Lein, have put together a useful package that challenges graphics lovers in a unique and imaginative way. You will soon find out that your imagination does not have to be limited to flat screen images, but can display depth and movement in a way not often seen on the likes of a CoCo.

(Logicware, 730 W. McDowell Rd., Phoenix AZ 85007; 602-821-2465, $32.95 plus $3 S/H)

— Jerry Semones

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Make Your Own *Banner*

Banner is designed to print banners, which it does without fuss or fanfare. The 16-page booklet of instructions is well-written. In clear, simple, easy-to-understand language it tells how to load the program and operate it.

Need a "HAPPY BIRTHDAY" sign for the kiddie party or a "VOTE FOR JOHN HATHAWAY" sign for the political rally? *Banner* produces what you want with neatness and dispatch. Well, the dispatch depends on the printer. I used 600 baud and the speed was satisfactory, but not blinding. If your equipment permits, you can have only one cup of coffee while printing a sign of several words, but don't expect the printer to throw it out faster than you can fold the output.

The menus are clear, complete and easy to use. When the program is loaded with `LOADM"BANNER`, the first menu comes up on the monitor and asks what baud rate to use. After selecting a baud rate, you are asked if you want a line feed after each carriage return. After you answer this question the main menu comes up, providing eight possible selections. The first selection invites you to enter the message you want printed on the banner. Just type out the message as if you were using a typewriter and press ENTER. Next, select Display Message and check your entry for correctness. If all is well, select Print and watch the banner being prepared before your very eyes!

Banner uses Xs to fill out the characters on the sign or banner unless you select a different character at the main menu, such as graphics blocks for solid figures. The letters are Roman, well-proportioned and neatly formed. The result is easy to read and makes an attractive display.

Other selections from the main menu permit entries of various printer codes to change the height of the characters, etc.

Banner is a fun program and I recommend it even if you don't need banners!

(B. Erickson Software, P. O. Box 11099, Chicago, IL 60611; 312-276-9712, $25)

— Charles L. Redman, Jr.

Hint . . .

GIME That Lowercase

This one is for the CoCo 3. As you well know, the Color Computer features true lowercase in the 40- and 80-column modes, but not in the 32-column mode. However, the GIME allows emulation of the MC6847T1. To enable the lowercase in the 32-column mode, just enter `POKE&H95C9,&H7F:POKE&HFF33,&H10`.

Bob Rosen
Howard Beach, NY

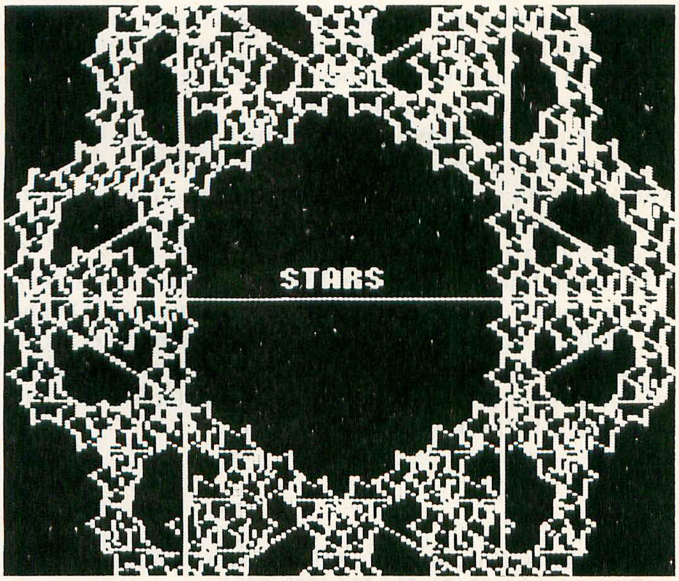
Easy-To-Use *D.L. LOGO* Is as Simple as ABC

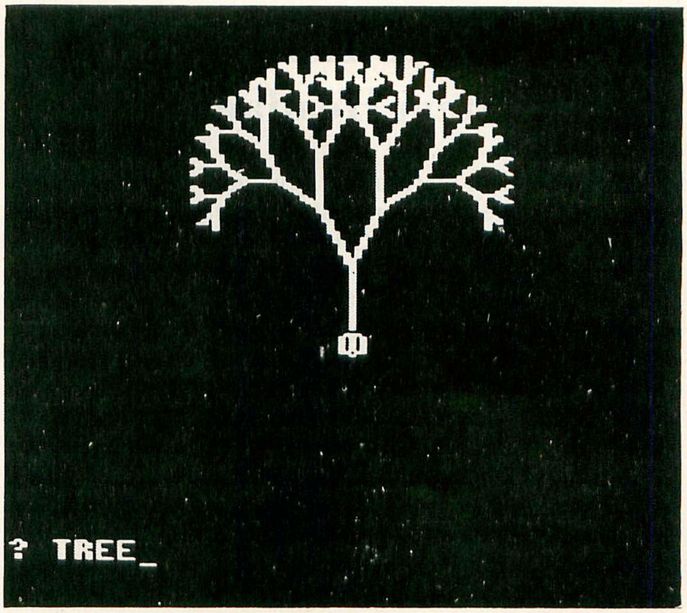
What is *D.L LOGO*? In a nutshell, *D.L. LOGO* is a programming language that uses English instead of symbolic commands. No line numbers are used, as it is also a structured language. It has gained popularity in educational circles, and seems to be a good introductory language. Many school systems are standardizing on *D.L. LOGO* for young students.

To run *D.L. LOGO* on your Color Computer you must have a 64K Color Computer and one disk drive. The programming language uses the OS-9 operating system and is a good example of quality OS-9 programming. But you don't need OS-9 to use LOGO. A boot program is included in the back of the manual for users with Disk BASIC 1.0.

To use all of the functions you also need the following optional equipment: Multi-Pak, Speech/Sound Cartridge, X-Pad Graphics Tablet, two joysticks and a dot matrix printer. For speech capabilities you need both the Multi-Pak and Speech/Sound Cartridge. The Multi-Pak is also recommended for the X-Pad.

The documentation is excellent. The manual is slightly over 400 pages long and starts with the very basics and continues with a logical progression of all of the commands and functions. Many programming examples are given and a summary is included at the end of each chapter. I would classify the manual as hands-on and informative, but not technical.





```
? TREE_
```

D.L. LOGO uses a method of drawing called "turtle graphics." Two types of screens are used. One is a text screen for program development, and the other is a graphics screen for programs. When using the graphics screen, 16 background and foreground colors are possible. English commands are used to move the turtle around the graphics screen. The turtle leaves a tail. The graphics screen has 256 horizontal and 192 vertical steps.

You can do more than draw with *D.L. LOGO*. As in any other programming language, both string and numerical variables are supported. A full set of numerical and logical functions is included with variable precision from zero (an integer) to 100 places. When first loaded the precision is set to two places.

Sound/Speech is supported by `SAY` and `SOUND` primitives. (*D.L. LOGO* calls commands primitives.) Using these audio commands, an example is given for how to use your CoCo as a talking alarm clock. How about that?

A full set of file-handling commands is also included. An editor is included for memory-resident files. As in any other language, you can store and retrieve files using your disks. One example in the manual is a disk catalog program.

Dale Lear, the author of *D.L. LOGO*, has really done justice to LOGO for the Color Computer. I am pleased to see Radio Shack make the commitment to education by the introduction of this type of program.

There was one problem. I never could get the demo program to fully execute. I kept getting an OM Error. Several other programming examples on the production disk ran without a flaw.

I recommend *D.L. LOGO* as a full implementation of LOGO for the Color Computer. If you are having trouble understanding BASIC, or are already familiar with LOGO, try it; it's like learning your ABCs.

Editor's Note: *Hotel CoCo*, a game requiring *D.L. LOGO*, is scheduled to appear in next month's issue.

(Available in Radio Shack stores nationwide, Catalog No. 26-3033, $99.95)

— Dan Downard

Map 'n Zap Relieves Disk System Headaches

Do you want to learn about how and where programs are actually stored on your disks? Have you ever had the frustrating experience of I/O Errors with your disks? Have you ever killed a file only to immediately (yet, not quickly enough) realize it was your favorite game from THE RAINBOW? Then *Map 'n Zap* is for you!

Map 'n Zap is a disk editor and repair system intended for anyone who has discovered the headaches that go with owning a disk system. This person might be a layman or a big-time "hacker." Disk drives really are nice. They provide a great amount of fast and usually reliable data storage. Occasionally, though, things go awry and you are stuck with a disk you would like to use for a coffee cup coaster. The *Map 'n Zap* manual, along with the associated programs, will take you away from your misery and put you back in business.

With *Map 'n Zap*, you can alter how data appears on the disk. You can edit the directory and restore those inadvertently killed files. You can even edit your programs directly on the disk. The included manual takes you from step one of disk repair through the entire process. At the same time, it gives you a good deal of knowledge about your disk system and how files are stored. While the manual may sometimes get a little over the head of the average user, one or two rereadings of the confusing section will usually clear things up. It is obvious that much thought was given to providing a package for the novice as well as for the advanced CoCo user.

I am thoroughly impressed with what Duck Productions has done. They have offered an excellent package, which includes a bonus directory program and several disk utilities, at a quite affordable price. Everyone who uses a disk drive with his CoCo should have a disk zap program, and *Map 'n Zap* is definitely one which should not be overlooked.

(Duck Productions, 18 Rowe Court, Brampton, Ontario, Canada L6X 2S2; 416-456-0032, $19.95, $24.95 Cnd.)

— Cray Augsburg

Hint . . .

Cut It Out

To obtain a printout of a disk directory from your CoCo, first make sure your printer is set correctly and is online. Then, type

```
POKE111,254:DIR
```

and press ENTER. The disk will spin and your directory will be printed out for you. You may want to cut it out and tape it to the disk jacket so you will always know what program is where.

The Pony Express Rides Again

In 1860, when men were men and horsepower meant just what it said, the new wonder of data transfer technology was the Pony Express. Those brave riders sped the mail across the mountains and prairies, from Missouri to California, come hail or high water. The record time for the trip was a breathtaking seven days and 17 hours. And at a cost of $5 per half-ounce of mail.

Little more than a century later, we can send information over far greater distances at 2,400 characters per second. And at considerably lower cost, even though your monthly information service bill might make that hard to believe.

With a nod to those early riders, there is an information carrier for the new age: the Telenetics PonyExpress 24A modem.

The PonyExpress 24A is a 2400 baud external modem, featuring asynchronous operation, auto-dial/auto-answer capabilities and complete call progress monitoring. It is fully compatible with the Hayes AT command set, and is therefore compatible with most communications software available.

According to the Telenetics literature, the modem was designed for the greatest ease of operation. Only two LEDs are located on the front panel, one for "modem ready" and one for "on line." When you turn on or reset the modem, it performs a self-test and the modem-ready light comes on; when you make a connection, the on-line light comes on. And if you have problems, a convenient reset button is included on the front panel that puts it back through the automatic self-test.

On the back, along with the input phone line jack, is a jack for a telephone handset, a knob that controls the speaker volume, a power switch and, of course, the RS-232 port to connect it to your computer. Conveniently, a bank of four DIP switches is also located on the rear panel, rather than hidden away inside the chassis.

I have put the PonyExpress through its paces over the past 12 weeks, leaving it turned on for 10 hours a day even when it wasn't being used. It has stood up to the treatment like a champion. Had it not, it was reassuring to know that it comes with a three-year warranty.

Of special note is that the Telenetics PonyExpress 24A is being offered in a special online promotion on Delphi. For $330.95, significantly below retail, you can travel across the land with the speed of the PonyExpress. For more information about the offer, send electronic mail to username 2400MODEM.

(Telenetics Corporation, 895 E. Yorba Linda Blvd., Placentia, CA 92670; 714-524-5770, $495)

— Kevin Nickols

B.E.S.T. Expert System Toolkit

Thinking Software has produced a simple menu-driven approach to generating your own rule-based backward chaining expert system. An expert system asks the user a series of questions to be answered on a scale of zero to 10. The expert then decides on a correct solution. Questionnaires that rate the level of stress in your life or your life expectancy would be good examples of simple expert systems. Large scale systems can be created with hundreds of questions and dozens of possible solutions. An expert system could be built to help you decide what's wrong with your car or if you should take a sick pet to the vet.

Simple menus and clear prompts make *B.E.S.T.* easy to use. You must type in all the questions the expert might need to ask. Then, you type in all the possible solutions and rate each question as it relates to the solution. You can add or modify questions and solutions at any time, so you don't have to complete the system in one sitting.

The expert is smart enough to ask only the questions that it needs to decide on a solution. Often, this will be all the questions in the system. If, however, the expert can tell from your answers that certain solutions have zero possibility of being true, the expert skips any further questions that deal with those solutions.

You do need to keep in mind that the expert is only as good as the questions and solutions that you type into it. The expert is not smart enough to learn from experience.

Though I couldn't test it, the expert toolkit is supposed to work on the new CoCo 3. A talking version is also available for use with the Radio Shack speech cartridge.

Bad points: The expert toolkit would not run properly on a CoCo 1 (D board). Software developers need to remember that not all CoCos are 2s and 3s.

Any expert system that you create must be first booted from the toolkit disk, making it awkward for users who are unfamiliar with computers. Even more unfortunate is that the toolkit disk is copy protected. This one disk that is used to create and start-up any and all of your expert disks will be subject to a lot of wear, yet there is no way to make a backup for safety or to use with each expert system disk. You can, however, order a replacement disk for $5.

The screens that display the title and directions are shown for a set length of time. Average readers will have no problem, but slow readers may not be able to finish reading the directions in time. A prompt to press a key when finished reading would have been better.

The *B.E.S.T.* expert system you create is rather slow as it asks the questions, though the manual does state that the speed-up poke can be used if your computer can handle it.

(Thinking Software, 46-16 65th Place, Woodside, NY 11377; 718-429-4922, B.E.S.T. Expert System with Stock Market and Executive Health Expert Systems ready to consult, $59.95; talking version, $64.95)

— James Ventling

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WRITEST Is the Teacher's Pet

Tests, exams and quizzes may be the cause for student nightmares but are a vital part of a teacher's daily life. Preparing tests is a time-consuming chore that can be made simpler if the teacher has a CoCo and *WRITEST.*

WRITEST is a test preparation program that produces many copies of Matching, Multiple Choice, True or False, and Short Answer or Long Answer tests on your printer. The program randomizes input or re-randomizes the order on command. *WRITEST* is programmed in BASIC allowing changes to be easily made.

The program is written for a minimum 32K CoCo, requires a cassette recorder and an Epson RX-80 printer with Graftrax. However, any 80-column printer may be used with suitable changes in printer code. The program uses the full capability of the printer, including Pica wide, Elite, condensed, emphasized and double strike. Underlining and superscripts are possible, as well as a variety of specially programmed symbols for mathematical usage such as pi, radicals, angles and circles.

Since it's written in BASIC, the program consumes a large amount of RAM. The instructions recognize this problem and recommend the use of `POKE 25,6` to free about 1,500 bytes. Deletion of statements regarding print codes and a possible `RENUM` provide another 500 bytes. Having received the program on cassette, I first tried to copy and run it on disk but received Out of Memory statements for my trouble. The disk operating system just takes away too much memory from this program.

I also had problems with memory on cassette until I followed all the recommendations for additional free memory. Being challenged by running this program on disk, I experimented. The `POKE 25,6:NEW` shut everything down in the disk mode. However, deleting the statements regarding print codes and renumbering (`RENUM 1,1,1`) provided sufficient memory to operate with my system. Once I was past these obstacles, I was able to generate some tough tests.

The menu for test creation is straightforward and easy to follow. I tried all the formats and easily produced professional looking documents. Tests can be filed (on tape) and reloaded to be modified or used again. Options are provided in the formats. The program also allows the allocation of scores for each question.

The documentation is extensive, 12 pages, but I had a little problem understanding what the program did until I ran it. The author goes into features and printer codes immediately without describing what the program can do. The documentation is good, particularly the printer code section for other printers, and the trouble-shooting section.

The programmer states that the program is sent at his cost ($2) and he would appreciate it if you would send "whatever you feel it is worth, after you have had a chance to use and evaluate it." It is difficult for me to judge the value of *WRITEST*, but it is certainly capable of producing professional exams in the formats described above and could save time for a teacher.

(Cocosoft, Darryl L. Petrak, Beech and Broadway, Box 665, House, NM 88121; tape only, send what it's worth to you)

— Mel Siegel

Hint . . .

Silence Is Golden

Many I/O Errors encountered when loading programs from tape can be corrected. Often, the user is trying to load a program with the tape positioned past the point where that program starts. You must start the loading process at a point where there is no data on the tape — the quiet space between the programs. One way to make sure you're at one of these points is to issue the following commands:

```
AUDIOON:MOTORON
```

then press ENTER. You will hear the high-pitched noise of computer data through your TV speaker. When the noise stops, you are at a silent spot. At this point, force a Syntax, or SN, Error by pressing a letter key and then ENTER. You can then load your program.

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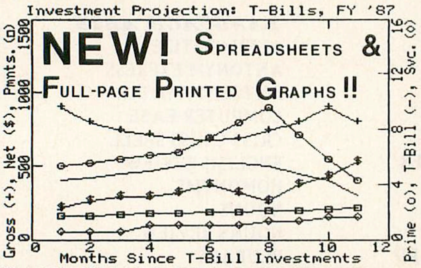

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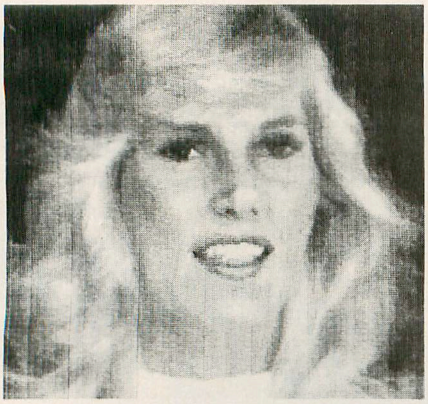
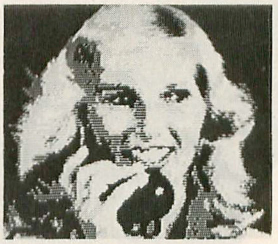
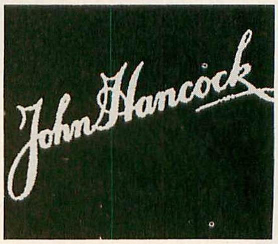

Printout


Screen



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HARDWARE PROJECT

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The CoCo ROS, Part II: Building the ROS Circuit

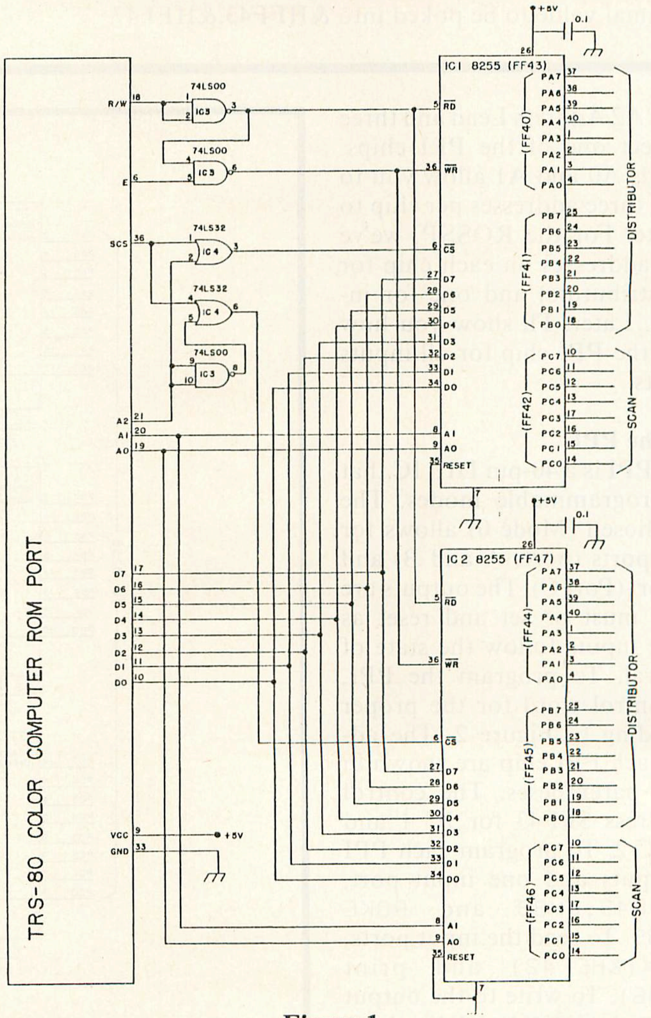
By Dennis H. Weide

Last month, I introduced you to the CoCo ROS and gave you a brief explanation of what it can do. This month, I'd like to show you the actual ROS circuit and give some tips on how to build and test it. I'll explain how the circuit works and how to program it.

The ROS Design

The idea for the ROS circuit came from the book *TRS-80 Models I, III, & Color Computer Interfacing Projects*, by William Barden, Jr. It's an excellent book on interfacing projects and shows various methods for interfacing the CoCo. Borrowing from his idea, I've increased the capacity of the original circuit by adding a second 8255 Processor Peripheral Interface chip and providing the proper address, read/write and chip select (CS) decoding for it.

Figure 1 is the programmable peripheral interface circuit used by the ROS. We'll refer to it as the Robot Operating System Signal Processor circuit or simply the ROSSP. It uses two 8255 PPI chips whose data buses are connected in parallel. The chip select (CS)



TRS-80 COLOR COMPUTER ROM PORT
R/W 18
E 6
SCS 36
A2 21
A1 20
A0 19
D7 17
D6 16
D5 15
D4 14
D3 13
D2 12
D1 11
D0 10
VCC 9
GND 33
+5V
74LS00
IC3
74LS32
IC4
IC1 8255 (FF43)
IC2 8255 (FF47)
+5V
0.1
RD
WR
CS
RESET
(FF40)
(FF41)
(FF42)
(FF44)
(FF45)
(FF46)
DISTRIBUTOR
SCAN
PA7 PA6 PA5 PA4 PA3 PA2 PA1 PA0
PB7 PB6 PB5 PB4 PB3 PB2 PB1 PB0
PC7 PC6 PC5 PC4 PC3 PC2 PC1 PC0

Figure 1

Dennis Weide is a communications technician for AT&T communications in Albuquerque, New Mexico, where he programs AT&T and IBM PCs. He enjoys making toys and teaching computer programming.

Figure 2: PPI Control Word Layout

Bit	Function		
0	Port C (lower)	1=Input	0=Output
1	Port B	1=Input	0=Output
2	Mode select	0=Mode 0	1=Mode 1
3	Port C (upper)	1=Input	0=Output
4	Port A	1=Input	0=Output
5,6	Mode select	00=Mode 0 01=Mode 1 10=Mode 2	
7	Mode set flag	1=Active	

Examples:

Dec Value	Binary Value	Input Ports	Output Ports
128	10000000	None	A,B,C
129	10000001	C(lower)	A,B,C(upper)
130	10000010	B	A,C
131	10000011	B,C(lower)	A
136	10001000	C(upper)	A,B,C(lower)
144	10010000	A	B,C
146	10010010	A,B	C
154	10011011	A,B,C,	None

Decimal value to be poked into &HFF43,&HFF47

lead uses the A2 Address Lead and three gates to select one of the PPI chips. Address leads A0 and A1 allow you to select one of three addresses per chip to read or write. For the ROSSP, we've chosen two addresses on each chip for outputs (distributors) and one for inputs (scans). Later, I'll show you how to program the PPI chip for all inputs or all outputs.

A Look at the PPI

The 8255 PPI is a 40-pin DIP IC that has three programmable modes. The mode I've chosen (Mode 0) allows for two output ports (ports A and B) and one input port (Port C). The outputs are latched and must be set and reset as desired. The inputs follow the state of the peripheral. To program the PPI, poke the control word for the proper mode according to Figure 2. The addresses for each PPI chip are shown in Figure 1 in parentheses. The control word is address $FF43 for IC 1 and $FF47 for IC 2. To program each PPI for two outputs and one input port, `POKE &HFF43,&H89` and `POKE &HFF47,&H89`. To read the input ports, print `PEEK(&HFF42)` and print `PEEK(&HFF46)`. To write to the output ports, `POKE &HXXXX,YYY` where *XXXX* is the hexadecimal address to load and *YYY* is the value (0-255) to write. For example, to write to address $FF40 Port PA3 only, `POKE &HFF40,8`; 8 is the binary value of Bit 3. You can use the `AND`, `OR` and `NOT` functions to control multiple actions from the same address. Figure 3 shows how I wired the inputs and outputs for use in the ROSSP. Each 8255 PPI chip requires one circuit of Figure 3. Only one bit of each chip is shown wired although all bits must be. For IC 2, the pin designations change from 1-8 to 10-16. All other designations stay the same. Besides the ROSSP, this circuit has many other useful applications.

A Look at the Octal Buffers

For buffering between the 8255s and the peripheral equipment, I've used 74LS240s and 74LS244s. These 20-pin DIP octal buffers/line drivers are capable of handling 40 milliamps of current; enough to drive high-resistance relays or LEDs. The 74LS240 buffer inverts the input signal; the 74LS244 doesn't. Using these two buffers, you can design many different circuit configurations. For the ROSSP, the enable leads (pins 1 and 19) are grounded to enable all outputs at all times. In Figure

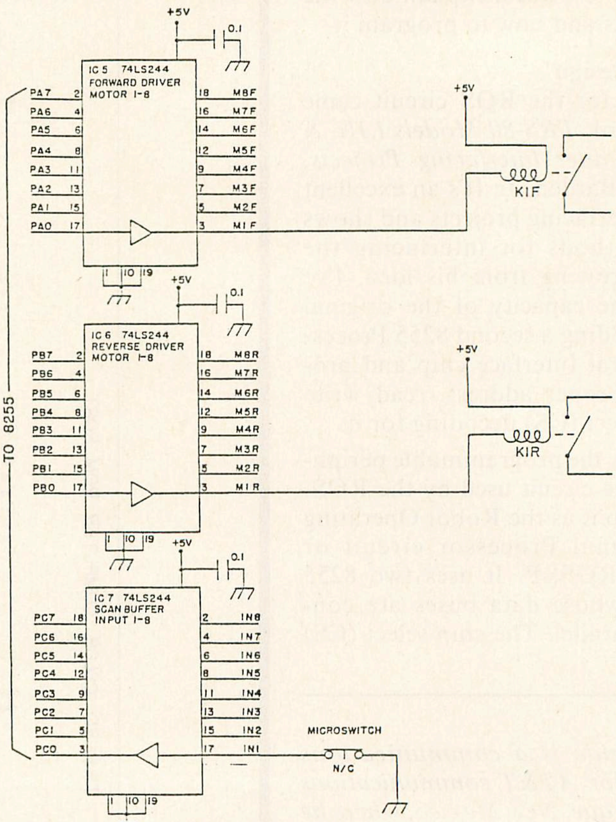

+5V
0.1
IC 5 74LS244
FORWARD DRIVER
MOTOR 1-8
PA7 2
PA6 4
PA5 6
PA4 8
PA3 11
PA2 13
PA1 15
PA0 17
18 M8F
16 M7F
14 M6F
12 M5F
9 M4F
7 M3F
5 M2F
3 M1F
1 10 19
K1F
IC 6 74LS244
REVERSE DRIVER
MOTOR 1-8
PB7 2
PB6 4
PB5 6
PB4 8
PB3 11
PB2 13
PB1 15
PB0 17
18 M8R
16 M7R
14 M6R
12 M5R
9 M4R
7 M3R
5 M2R
3 M1R
K1R
TO 8255
IC 7 74LS244
SCAN BUFFER
INPUT 1-8
PC7 18
PC6 16
PC5 14
PC4 12
PC3 9
PC2 7
PC1 5
PC0 3
2 IN8
4 IN7
6 IN6
8 IN5
11 IN4
13 IN3
15 IN2
17 IN1
MICROSWITCH
N/C

Figure 3

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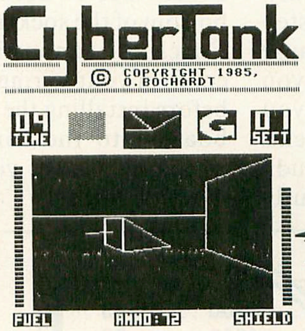

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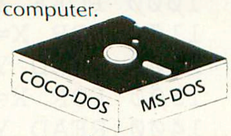

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3, the 74LS240's drive relays direct. A high on any input to the buffer causes a low output, which in turn operates the relay. The *ROS program* is designed so that only one relay can operate at a time, thus allowing the entire ROSSP to be powered from the computer. Use relays with a high resistance winding so that current requirements are kept as low as possible. If you build a separate +5-volt power supply, be sure to keep a common ground between the computer and the ROSSP.

To operate any particular relay, write the bit value of that relay to the address of that port. When any port of the 8255 is poked to zero, all relays are released. When it's poked with a value between 1 and 255, the corresponding relays will operate.

Building the ROSSP

Building the ROSSP circuit is easy. We won't go through a step-by-step description of how to build it because construction isn't critical. I'll give you whatever hints are necessary to help you along. If you're inexperienced in circuit construction, I recommend you study the article and schematics carefully before beginning. If necessary, find someone in your local CoCo club to guide you along. After you've built this project, you'll be ready for almost anything.

If possible, use wire-wrap connections and 30-gauge wire. You can use point-to-point soldering, but wire wrapping is faster and easier. Keep the leads from the ROM port to the PPIs as short as possible. Use .1mfd capacitors across the power leads of all ICs to prevent high-speed switching errors. All other wiring is non-critical.

I used a double-sided Vector 3795 board with a pin spacing of .1 inch. I had to cut the pins on each side of the board to make it a 40-pin board. Any double-sided circuit board with a pin spacing of .1 inches and at least 40 pins can be modified to work. If you use the Vector board, you'll have to add on a piece of perfboard to fit the entire circuit. Use IC sockets and IDs for the bottom of the sockets to assist in wiring. Check all connections carefully and confirm your wiring with an ohmmeter before installing the ICs or plugging the board into the computer. When the wiring is correct, you're ready to plug it in and test it.

Testing the ROSSP

Using the program listing and last month's logic tester, you can test the circuit. First, turn off the computer. Then plug the ROSSP into the ROM port. Be sure that the circuit board fits properly into the port. A shorted pin could destroy the 6809E microprocessor chip. Connect the logic tester to +5 volt (red lead) and ground (black lead) of the ROSSP then turn the computer power on. Load and run the BASIC program.

Follow the instructions on the screen to test the two 8255 PPI chips and the four 74LS240 buffer chips. Test the 74LS244 buffer chips using the PEEK command and grounding the input leads one at a time. A grounded input lead will cause the corresponding bit to be reset when the PEEK command is executed. If no input leads are grounded, the PEEK command will return a value of 255.

Next month, we'll take a look at the ROS program and discuss how to connect the circuit to the Robotix R-2000 kit. We'll also take a look at a sample ROS program. Until then, have fun with this one. ☐

2300 143
4200 78
5800 4
END 62

The listing: ROS TEST

```
100 '       PROGRAM LISTING 1
200 '       ROS TEST PROGRAM
300 '       BY DENNIS H. WEIDE
400 '       (C) 1986
500 '       FOR TESTING THE ROSPPI
 CIRCUIT
600 '
700 '
800 CLS:POKE &HFF43,137:POKE &HF
F47,137
900 POKE &HFF40,0:POKE &HFF41,0
1000 POKE &HFF44,0:POKE &HFF45,0
1100 FOR X=0 TO 7
1200 READ Y:PA(X)=Y:NEXT X
1300 FOR X=0 TO 7
1400 READ Y:PB(X)=Y:NEXT X
1500 FOR X=0 TO 7
1600 READ Y:PC(X)=Y:NEXT X
1700 PRINT
1800 '    SET PIN NUMBERS
1900 DATA 4,3,2,1,40,39,38,37,18
,19,20,21,22,23,24,25,3,5,7,9,12
,14,16,18
2000 CLS:PRINT:PRINT
2100 PRINTTAB(6)"ROSPPI TEST PRO
GRAM"
2200 PRINT:PRINTTAB(4)"1. TEST 8
255 PPI'S "
2300 PRINT:PRINTTAB(4)"2. TEST 7
4LS240 BUFFERS"
2400 PRINT:PRINTTAB(4)"3. END CI
RCUIT TEST"
2500 PRINT:PRINTTAB(4)"ENTER ONE
 OF THE ABOVE";
2600 INPUT Q
2700 ON Q GOTO 3000,3500,2900
2800 GOTO 2000
2900 CLS:END
3000 AD=&HFF40:IC=1:P=1:GOSUB 43
00
3100 AD=&HFF41:IC=1:P=2:GOSUB 43
00
3200 AD=&HFF44:IC=2:P=1:GOSUB 43
00
3300 AD=&HFF45:IC=2:P=2:GOSUB 43
00
3400 GOTO 2000
3500 IC=5:AD=&HFF40:GOSUB 6100
3600 IC=6:AD=&HFF41:GOSUB 6100
3700 IC=8:AD=&HFF44:GOSUB 6100
3800 IC=9:AD=&HFF45:GOSUB 6100
```

```
3900 GOTO 2000
4000 '
4100 '      8255 TEST SUBROUTINE
4200 '
4300 CLS:PRINT"SET LOGIC TESTER
TO RED"
4400 FOR X=0 TO 7
4500 IF P=1 THEN 4600 ELSE IF P=
2 THEN 4700
4600 PRINT@64,"ADDR="HEX$(AD)"
 IC="IC"   PIN="PA(X):GOTO 4800
4700 PRINT@64,"ADDR="HEX$(AD)"
 IC="IC"   PIN="PB(X)
4800 PRINT@128,"OUTPUT IS LOW (R
ED)"
4900 PRINT:INPUT"PRESS <ENTER> T
O CONTINUE";Q
5000 POKE AD,2^X
5100 PRINT@128,"OUTPUT IS HIGH (
GREEN)"
5200 PRINT:INPUT"PRESS <ENTER> T
O CONTINUE";Q
5300 POKE AD,0
5400 PRINT@128,"OUTPUT IS LOW (R
ED)"
5500 PRINT:INPUT"PRESS <ENTER> T
O CONTINUE";Q
5600 NEXT X
5700 RETURN
5800 '
5900 '     74LS240 TEST SUBROUTI
NE
6000 '
6100 CLS:PRINT"SET LOGIC TESTER
TO GREEN"
6200 FOR X=0 TO 7
6300 PRINT@64,"ADDR="HEX$(AD)"
 IC="IC"   PIN="PC(X)
6400 PRINT@128,"OUTPUT IS HIGH (
GREEN)"
6500 PRINT:INPUT"PRESS <ENTER> T
O CONTINUE";Q
6600 POKE AD,2^X
6700 PRINT@128,"OUTPUT IS LOW (R
ED)"
6800 PRINT:INPUT"PRESS <ENTER> T
O CONTINUE";Q
6900 POKE AD,0
7000 PRINT@128,"OUTPUT IS HIGH (
GREEN)"
7100 PRINT:INPUT"PRESS <ENTER> T
O CONTINUE";Q
7200 NEXT X
7300 RETURN
```

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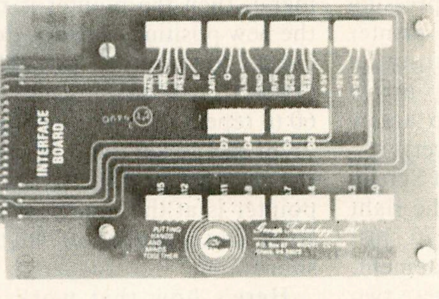

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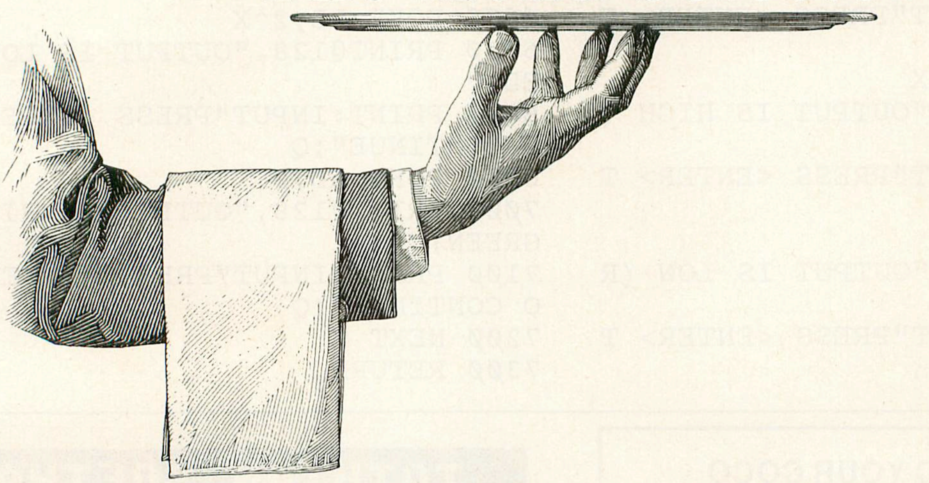


By Bill Bernico

I write a lot of programs that use menus. These menus typically have numbers next to each selection. To use that selection, you need only press that number and the program branches off accordingly. Well, that's OK if you're a no-nonsense programmer looking to create a bare-bones program and save as much memory as possible. However, if you want to add that extra touch to your program, here's a way to make the menu selections a little more interesting.

Look at the listing. Line 50 prints out the menu, just as you'd have to do with the old method. Lines 1000 to 1600 are merely samples of how the menu branches off. In your actual program you would replace these sections with routines from your own program.

Line 1700 is there so you can keep trying the program over and over. It can, and should, be deleted when you use this for your own program.

That leaves lines 60 to 150, the "meat" of this whole routine. Let's look at what's happening in each of them. What looks like an underline in Line 60 is actually a left arrow, created by pressing SHIFT and the up arrow. The printer prints it as an underline. Just substitute a left arrow for it. Also, the up arrow in Line 70 is printed as an up arrow without the tail (it's called a caret).

Line 60 prints the left arrow at Screen Position 180, which is just to the right of the first selection. In Line 70, just before the familiar `INKEY$` statement, you see two pokes. Inserting these two pokes immediately before this `INKEY$` statement allows the `INKEY$` command to repeat. Without these two pokes the program will still work but you'll have to press the arrow key each time you want to move the arrow up or down. With the pokes in place, you can simply hold the arrow keys and the pointer will continue to move as long as you hold down the arrow key. Line 70 checks the `INKEY$` to see if you press the up arrow, and acts accordingly. If you do press the up arrow and the pointer is lower than the top line, it moves the pointer up one notch.

Line 80 checks the `INKEY$` to see if you pressed the down arrow, which is `CHR$(10)`. If you did and the pointer is higher than the bottom item on the menu, then the pointer is reprinted at the new position, one line down. It also checks to see if you pressed ENTER, or `CHR$(13)`. If not, it goes back to Line 60 to repeat the pointing process. If you do press ENTER, the program continues to lines 90 to 150 to see where the pointer is at the time you press ENTER so it can branch off to the correct subroutine.

Here's how that works. For each `PRINT @` position on the screen there is also a poke position. This poke position is 1,024 plus whatever screen position you've printed at.

For example, if the pointer is pointing at the first selection, the "input items" line, then the pointer is being printed at Screen Position 180, which is Poke Position 1204 (1024+180). Line 90 peeks at Position 1204 to see if the left arrow occupies that space. The shifted up arrow that produces the left arrow on the screen is also known as `CHR$(95)`. If Peek Position 1204 contains a 95, then it goes to Line 1000, the section that deals with input items. Lines 100 to 150 check the other peek positions for the

---

Bill Bernico is a self-taught computerist who enjoys golf, music and programming. He is a drummer with a rock band and lives in Sheboygan, Wisconsin.

pointer and branch off when the pointer is found.

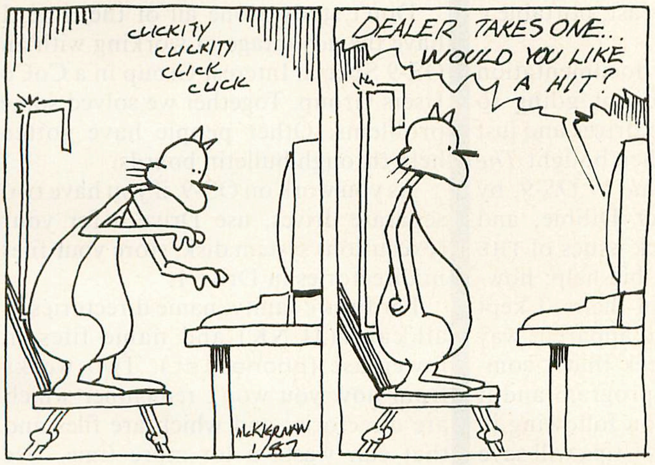
It may seem a little complicated at first, but once you grasp what's going on, you can create a really neat, eye-catching menu that people will remember. Go on. Give it a try. It doesn't take that much extra work or memory and it'll give your program an extra touch of professionalism.

(Questions about this tutorial may be directed to Mr. Bernico at 708 Michigan Ave., Sheboygan, WI 53081, 414-459-7350. Please enclose an SASE for a reply when writing.) ☐

The listing: MENUTUTR

```
10 'MENU SELECTOR TUTORIAL
20 'FROM KROMICO SOFTWARE
30 'BY BILL BERNICO
40 '
50 CLS:PRINT@105,"selections":PR
INT@168,"INPUT ITEMS";:PRINT@199
,"DELETE ITEMS";:PRINT@231,"SAVE
 TO DISK";:PRINT@261,"LOAD FROM
DISK";:PRINT@297,"SORT ITEMS";:P
RINT@330,"MAIN MENU";:PRINT@358,
"EXIT TO BASIC";
60 PRINT@A*32+180,"_";:A$=INKEY$
70 POKE341,255:POKE342,255:A$=IN
KEY$:IFA$=""THEN70ELSEIFA$="^"AN
DA>0THENPRINT@A*32+180:A=A-1:GOT
O60
80 IFA$=CHR$(10)ANDA<6THENPRINT@
A*32+180:A=A+1:GOTO60ELSEIFA$<>C
HR$(13)THEN60
90 IF PEEK(1204)=95THEN1000
100 IF PEEK(1236)=95THEN1100
110 IF PEEK(1268)=95THEN1200
120 IF PEEK(1300)=95THEN1300
130 IF PEEK(1332)=95THEN1400
140 IF PEEK(1364)=95THEN1500
150 IF PEEK(1396)=95THEN1600
1000 CLS:PRINT"INPUT SECTION":GO
TO1700
1100 CLS:PRINT"DELETE SECTION":G
OTO1700
1200 CLS:PRINT"SAVE SECTION":GOT
O1700
1300 CLS:PRINT"LOAD SECTION":GOT
O1700
1400 CLS:PRINT"SORT SECTION":GOT
O1700
1500 CLS:PRINT"MAIN MENU SECTION
":GOTO1700
1600 CLS:PRINT"EXIT SECTION"
1700 FORX=1TO1000:NEXT:RUN
```

CoCo Cat


CLICKITY
CLICKITY
CLICK
CLICK
DEALER TAKES ONE... WOULD YOU LIKE A HIT?
McKEEHAN 1/87
OF COURSE NOT! DON'T BE RIDICULOUS!
I ALWAYS SAY NO TO DRUGS!

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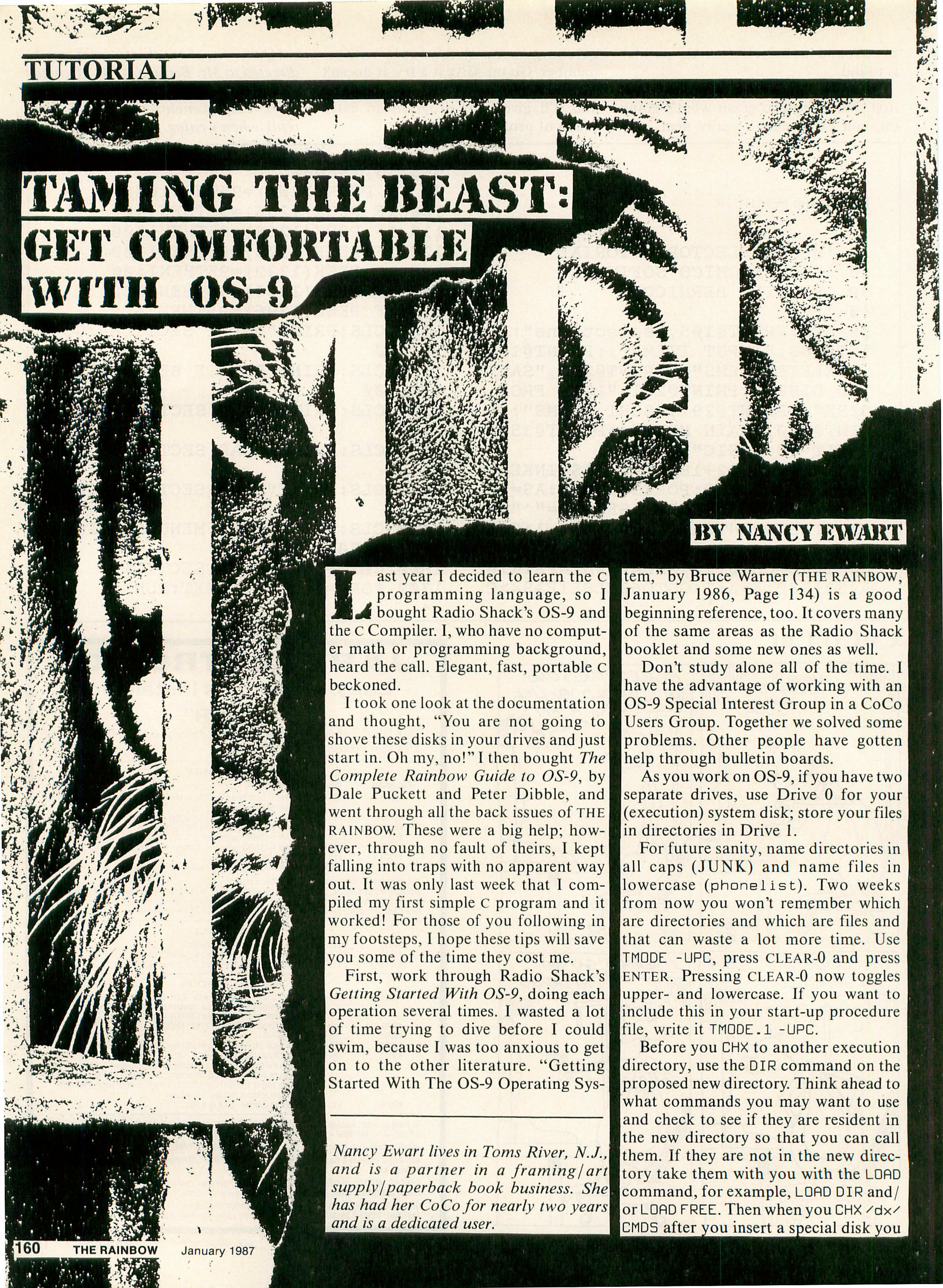

TAMING THE BEAST: GET COMFORTABLE WITH OS-9

BY NANCY EWART

Last year I decided to learn the C programming language, so I bought Radio Shack's OS-9 and the C Compiler. I, who have no computer math or programming background, heard the call. Elegant, fast, portable C beckoned.

I took one look at the documentation and thought, "You are not going to shove these disks in your drives and just start in. Oh my, no!" I then bought *The Complete Rainbow Guide to OS-9*, by Dale Puckett and Peter Dibble, and went through all the back issues of THE RAINBOW. These were a big help; however, through no fault of theirs, I kept falling into traps with no apparent way out. It was only last week that I compiled my first simple C program and it worked! For those of you following in my footsteps, I hope these tips will save you some of the time they cost me.

First, work through Radio Shack's *Getting Started With OS-9*, doing each operation several times. I wasted a lot of time trying to dive before I could swim, because I was too anxious to get on to the other literature. "Getting Started With The OS-9 Operating System," by Bruce Warner (THE RAINBOW, January 1986, Page 134) is a good beginning reference, too. It covers many of the same areas as the Radio Shack booklet and some new ones as well.

Don't study alone all of the time. I have the advantage of working with an OS-9 Special Interest Group in a CoCo Users Group. Together we solved some problems. Other people have gotten help through bulletin boards.

As you work on OS-9, if you have two separate drives, use Drive 0 for your (execution) system disk; store your files in directories in Drive 1.

For future sanity, name directories in all caps (JUNK) and name files in lowercase (`phonelist`). Two weeks from now you won't remember which are directories and which are files and that can waste a lot more time. Use `TMODE -UPC`, press CLEAR-0 and press ENTER. Pressing CLEAR-0 now toggles upper- and lowercase. If you want to include this in your start-up procedure file, write it `TMODE.1 -UPC`.

Before you `CHX` to another execution directory, use the `DIR` command on the proposed new directory. Think ahead to what commands you may want to use and check to see if they are resident in the new directory so that you can call them. If they are not in the new directory take them with you with the `LOAD` command, for example, `LOAD DIR` and/or `LOAD FREE`. Then when you `CHX /dx/CMDS` after you insert a special disk you

---

Nancy Ewart lives in Toms River, N.J., and is a partner in a framing/art supply/paperback book business. She has had her CoCo for nearly two years and is a dedicated user.

will be able to read the directory, etc. Do not forget to `CHX /dx/CMDS` when you want to return to your system disk. `CHX` and `CHD` go with you always without your loading them.

If you have OS-9 Version 2.0, learn to use the `help` command. If you are using an earlier version, build a help file with the most common commands and their syntax. I still don't remember from one session to the next all the details that must be typed exactly right.

Do not try to use commands relating to modules on simple files. You cannot use `ident`, for example, on start-up the way you can on `OS9Boot`. A file is not necessarily a module, although modules may be contained in a file. (Blood, sweat and tears were spent on this one.)

Make special system disks for special applications. See the February 1986 RAINBOW for two extremely helpful articles, "Creating OS-9 System Disks," by Donald Dollberg and "Getting Started with BASIC09," by Richard A. White. I put *TSEDIT* and the C Compiler (both Radio Shack) in the commands directory of one 80-track disk.

I made hard copies of important information about each of my system disks, then stored them in the disk jacket using `DIR >/p; FREE >/p; DIR CMDS >/p; MDIR >/p; MFREE >/p`.

When you feel secure with moving around the system, creating and saving files and using some of the more basic commands, tackle Dale Puckett's *The Complete Rainbow Guide to OS-9*, published in 1985 by Falsoft, Inc.

Keep asking questions. Sometimes you have to rephrase the question repeatedly for the same problem until you get a version of the question that communicates.

To Use *TSEDIT*

If you want to use C, you need an editor that lets you make square and curly brackets as well as back slashes. See the Appendix in the documentation for *TSEDIT*. Be sure to `SETIME`. *TSEDIT* should be in your current execution directory.

TSPARS must be in your current data directory if you want to change the parameters of the display. For use with the C Library, copy *TSPARS* to `/d1/SOURCES`.

At the OS-9 prompt type `tsedit` and press BREAK. Now type `i` (for insert) and type your copy, message or source code. Press BREAK and type `:w`*filename* (to save, the colon is important). Press BREAK and type `:p` (to print) and press BREAK and type `:q` (to quit).

To Compile and Run a C Program

Have *TSEDIT* and the C Compiler in Drive 0 and the C Library in D1. Now type:

```
chx /d0/cmds
chd /d1/sources
tsedit
```

(To save, press BREAK and type `:w` *filename*`.c`). Press BREAK and type `:q`.

If you have to change disks to have the C Compiler commands in Drive 0, do that now. Type `chx /d0/cmds` again.

```
cc1 filename.c
```

The program (source code) will now compile or abort.

```
filename
```

When you look at your current execution directory you will see the filename of your C program, but without the `.c`. The source code, *filename*`.c`, will be in the SOURCES directory. When you type the filename, the program will execute.

By paying attention to the small steps, the giant leap to C is possible. It's really quite easy!

(Questions about this tutorial may be directed to the author at 1861 Skiff Court, Toms River, NJ 08753, 201-270-8435. Please enclose an SASE when writing.) ☐

This is a copy of the help file I built.

```
echo syntax help
ECHO
ECHO FORMAT /DX
ECHO BACKUP (D0 TO D1 ASSUMED)
ECHO BACKUP D0 (SINGLE DRIVE)
ECHO BACKUP /D2 /D3
ECHO FOR FASTER BACKUP SPACE NUM
BER SYMBOL XXK (20K 32K)
ECHO DIR /DX/XXX/XXX
ECHO BE SURE TO LIST ALL DIRECTO
RIES, IN ORDER, TO FILE LOCATION
ECHO DIR ..  TO GO UP A DIRECTOR
Y
ECHO CHD /DX/XXX
ECHO CHANGE DATA DIRECTORY
ECHO CHD ..
ECHO ONE PERIOD FOR CURRENT LEVE
L PLUS
ECHO ONE PERIOD FOR EACH LEVEL Y
OU WANT TO GO UP
ECHO CHX /DX/BASIC09
ECHO CHANGE EXECUTION DIRECTORY
ECHO TYPE CHD /DX/MOREHELP
ECHO AT THE OS9 PROMPT TYPE "DIR
"
```

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See Rainbow Reviews August '86, pg. 149

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It Prints Slower Than Cold Molasses

By Richard E. Esposito
Rainbow Contributing Editor
with Richard W. Libra

I've got a 64K CoCo 2 with a Radio Shack CGP-220 ink-jet printer that prints slower than cold molasses when printing CoCo Max II *images. Do you know of any way that I can get my printer to print these pictures faster?*

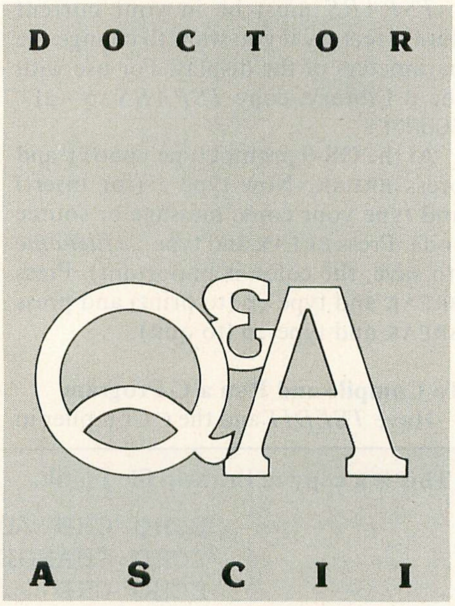
Harry Stonelake
Castro Valley, CA

℞ If the printer is not running at its limit, you can speed it up using a screen dump that is written in assembly language. If the printer's hardware can handle a higher speed, hiking the baud rate either via a built-in DIP switch or a serial-to-parallel converter, with the CoCo sending at 9600 baud or using a direct parallel interface such as the one on the J&M controller could make a noticeable difference. Of particular note with the *CoCo Max II* program is that the color driver will not print multiple colors at once with the CGP-220 printer. Colorware is reported to be updating the current version of *CoCo Max* to alleviate the problem, so help is on the way.

Cartoon Animation

I would like to know if there is any way I can make a computer animation of a person moving, similar to a cartoon video game. Also, can I use 64K and 32K programs or will I have to use only 32K programs with my 64K CoCo 2? Do I have to have a disk drive to gain access to this memory?

Brandon Carlton
Corona, CA



℞ *Assembly Language Graphics for the TRS-80 Color Computer* by Don Inman and Kurt Inman, Reston Publishing Company, Inc., may help in your search for animation programs. If you put your computer into all-RAM mode you can use the 15.75K space above the BASIC interpreter as well as the normal user memory for all your assembly language programs. You do not need a disk drive or OS-9 to take advantage of this memory.

Bright Screen Save

In Milt Webb's letter to the editor, May 1986, [Page 8], he gave a `POKE 359,57:SCREEN0,1` *to brighten the screen. This does give a much improved screen, however when I use this when typing in a program and try to save the program in the ASCII format with an A option, it starts the disk drive, scrolls the program list, then gives the OK prompt, but doesn't save the program. Is there any way to get the bright screen without this happening?*

Phill VanNoty
Hemet, CA

℞ Location 359 is the position of the three-byte RAM hook for the I/O. Standard BASIC has it set to RTS, Extended BASIC changes it to JMP $8273, DOS 1.0 changes it to JMP $CB4A, and DOS 1.1 changes it to JMP $CC1C. By poking an RTS, you eliminate some of the features of disk and extended BASIC, one of which is the ASCII save feature. If, after you finish editing, you poke back the original value (i.e., 126) you can restore those features.

Printer Decisions

I am about to buy a printer and can't decide what to buy. I have found a couple of printers and I would like your opinion as to which one would be the best for home use with graphics, text, and a little bit of business. The two printers are the Epson Homewriter 10 NLQ and the NEC PR103A NLQ.

Glenn Bailey
Rogersville, TN

℞ Of the two you mentioned, the Epson has a more standard protocol, thus finding graphics software support for it is much easier. Before making a decision however, see the November 11, 1986 issue of *PC Magazine* which reviewed 97 new printer models for 1986. To ensure availability of the ribbons and software support, you might want to stick with name brand printers which are IBM-graphics compatible. The major printer manufacturers are IBM, Tandy, Epson, Star-Micronics, Toshiba and Okidata.

Richard Esposito is a project engineer for TRW's Federal Systems Group. He holds bachelor's, master's and doctorate degrees from Polytechnic Institute of Brooklyn. He has been writing about microcomputers since 1980.

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"The Editor is a very good one and could be the subject for review all by itself..." *--The RAINBOW, March 1986*

"Comparing ECB's edit mode to CBASIC's text editor is like comparing a World War II jeep to a modern sedan. Both get you to your destination, but what a difference in the ride. *-- Hot CoCo, Feburary 1986*

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ROM Pak on Disk

I am in the process of writing a book and have been using the Color Scripsit *ROM Pak/cassette. Instead of using the ROM Pak system, I would prefer to store my material on disk. Not only does it have more memory, but it allows me to chain the material together. My problem is that this ROM Pak system does not load into my* Telewriter-64 *or* Elite Word Disk *word processers. Can you help me solve this problem?*

Norm Neaveill
East Moline, IL

℞ Use the Print-to-Tape option on *Scripsit*, then use the program from November's column for transferring assembly language tapes to disk (use the already numbered option) to get the resulting ASCII files on disk for *Telewriter-64* or *Elite Word.*

Learning OS-9

I recently purchased the OS-9 PASCAL system for the Color Computer in hopes of learning PASCAL. Unfortunately, I have not yet been able to even create a PASCAL source program, which is the first step listed in the instruction manual which came with this software. I'm totally confused with the instructions in this manual and can't get specific answers from my local Radio Shack store. Does this OS-9 package need, for example, the TSEDIT *package? Why does the OS-9 system seem so difficult to intrepret? Any help you can give would be much appreciated.*

Alfred Walser
Monroe, WA

℞ When you purchase OS-9, it comes with its own line-oriented text editor. Read Chapter 2 of the orange *OS-9 Program Development* manual. Also, see pages 73-75 and 180 of Dale Puckett's *The Complete Rainbow Guide to OS-9*. If you, like me, prefer a more sophisticated full-screen editor, there are (at extra cost) *Stylograph, Dynastar*, and *TSEDIT.*

To some, OS-9 is a blessing, but it's also a pain, especially to beginners. Since most OS-9 software was originally written for $15,000-plus micro-mainframes, the superior quality is evident, but unfortunately for beginners, the documentation was written for professionals. If you need help, write us. Documentation can be written, but good software at a reasonable price is hard to find.

Television Interference

When I turn on my CoCo with my disk controller installed, I get some TV interference, but not enough to bug me. When I boot up my machine with CoCo Max *with a Y cable however, I get so much interference that I can't even see the screen. I've noticed that when I'm inputting or outputting to disk, the interference pretty much goes away. I've installed a Thunder RAM 256K upgrade. Could that be causing the problem?*

Eric Hochstetler
Mooresville, IN

℞ Both the Y cable and the 256K are contributors. Switching to a monitor should help. Eliminating the switch-box on the back of your TV and making a direct coaxial connection should also help some.

Binary Code Identification

Is there any way for the CoCo with Disk Extended Color BASIC to identify binary code such as A=01000001, etc.?

Bryant Wilkie
Mountlake Terrace, WA

CORRECTIONS

"The Power of the Palette: Graphics on the Color Computer 3" (October 1986, Page 37): The *Tunnel* program contains an error on the RAINBOW ON DISK and RAINBOW ON TAPE. Due to a production error, Line 540 of the program on these products became garbled. The line appears in order as Line 7226. Because of this, you will get a ?UL Error in Line 250. To correct the problem, delete Line 7226 and enter Line 540 as it appears in THE RAINBOW.

"Coming to 'Terms' With the CoCo 3" (November 1986, Page 93): Because of a production error, the `TERM3BAS` file on the RAINBOW ON DISK and RAINBOW ON TAPE fails to operate. This is because the `WIDTH` command in Line 450 was not properly tokenized during the file transfer. To correct the problem, simply load the program, type `EDIT 450` and press ENTER twice. Then, resave the file.

Dale Lear has also written to tell us of a patch for the *Term2* program. *Term3*, as it appears in THE RAINBOW, will not work on some BBSs (including CompuServe) because of the manner in which it detects carriage returns. Dale's fix for the program involves adding the following lines to the BASIC startup file, `TERM3BAS`.

```
551 POKE &H6260,&H20
552 POKE &H6261,&H11
553 POKE &H6273,&HD6
554 POKE &H6274,&H07
555 POKE &H6275,&HC4
556 POKE &H6276,&H7F
557 POKE &H6277,&H20
558 POKE &H6278,&HE9
```

"Monochrome Magic on the CoCo 3" (Hint, December 1986, Page 48): In addition to displaying the Microware name, the `CLS9` statement also clears the border to the background color.

For quicker reference, Corrections will be posted on Delphi as soon as they are available in the Info on Rainbow topic area of the database. Just type `DATA` at the CoCo SIG prompt and `INFO` at the Topic? prompt.

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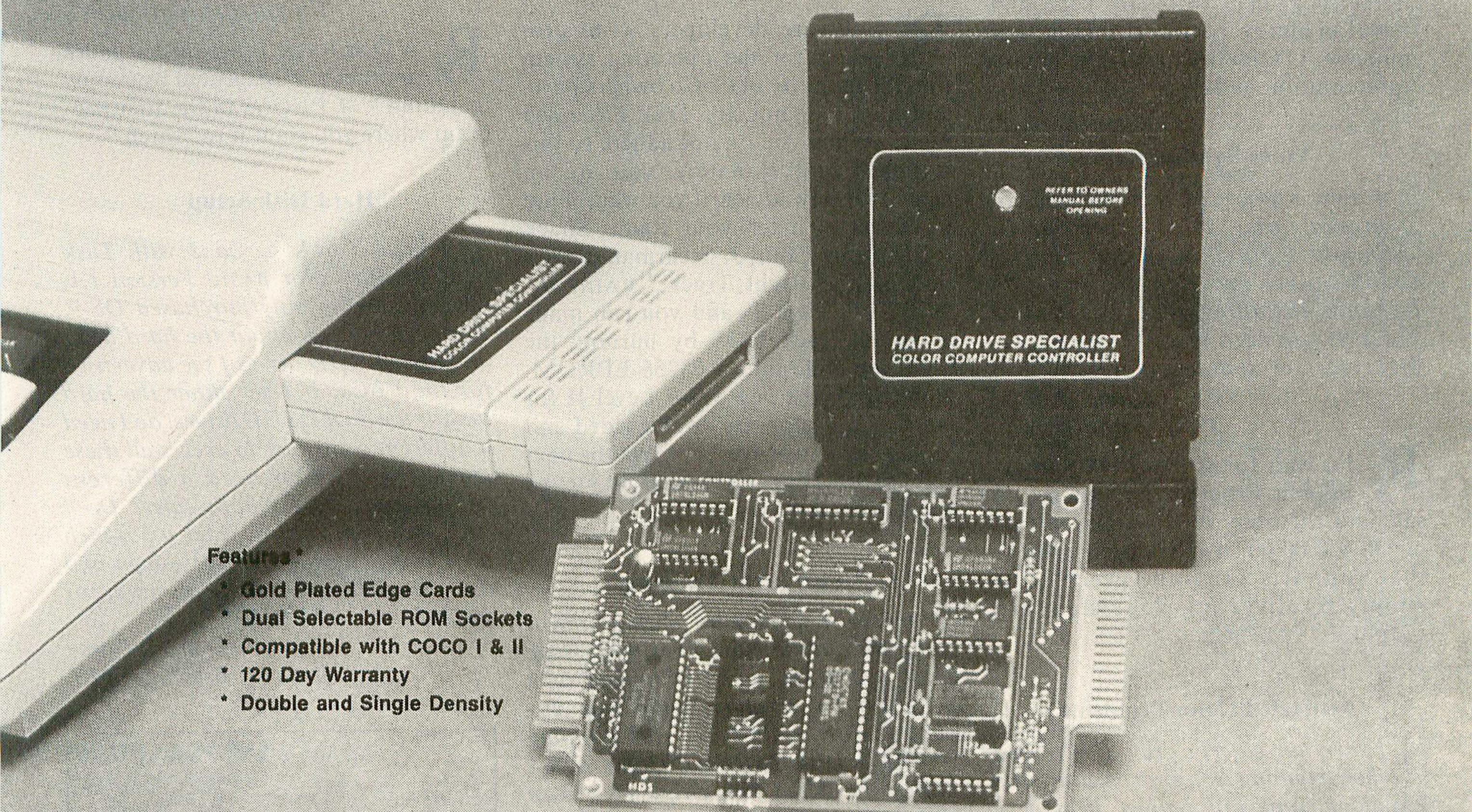
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℞ The CoCo's BASIC intrepreter has built-in functions for converting back and forth between decimal and hexadecimal. Since each Hex digit can independently be converted to binary, the answer is sort of yes. For example: `?HEX$(241)` yields the Hex value F1, and since F=1111 in binary code and 1=0001 in binary, putting them together you have; 11110001 which is the binary representation of 241.

Voice Synthesizers

I own a 64K CoCo 2 and want to have a voice synthesizer for it. Should I purchase Radio Shack's Sound/Speech Program Pak, or should I chance installing the SP0256-AL2 Voice Synthesizer, which needs a 2.12-MHz clock crystal, and more?

James Klimm
Pelly, Saskatchewan

℞ I'd wait for the 26-3144 Sound/Speech Program Pak to go on sale and then buy it. Since the release of OS-9 2.00.00, it has a device driver that supports sending speech to it simply by diverting your standard output.

Artifacted Color Problems

I own an elderly gray CoCo and when running some programs, the colors come out wrong. It is very annoying to play card games with green hearts and diamonds! By pressing reset and typing, the correct colors eventually appear. With some games, the screen fills with red. By pressing BREAK until it comes up blue, the correct colors will appear when the game is started. Is there a line that I can add to the beginning of graphics programs to ensure that the correct colors will appear?

Herb Sinclair
Wenatchee, WA

℞ The artifacted color set on the CoCo 1 and 2 is unpredictable and cannot be fixed with software; however, on the CoCo 3, the alternate set is obtained by powering up with the F1 pressed.

J-DOS Support

Does anyone write software to support J-DOS? When I upgraded to disk on my CoCo 2, I bought the new J&M JFD-CP controller with both J-DOS and RS-DOS installed. Since then, I have watched for word processer and spreadsheet programs advertised to run under J-DOS so that I can fully use my double-sided, 40-track drives. I know that OS-9 will work, but I don't care to convert. Can you give me any clues to help me on my search?

Tom Rea
Chicora, PA

℞ Software developers write programs for the operating system that the majority of CoCo owners have, and like it or not, it's Disk Extended BASIC. When you do not adhere to this standard, unfortunately, you are on your own. My advice, if you want more tracks, is to patch your Radio Shack ROM using Colin J. Stearman's "Getting on the Right Track," RAINBOW, July 1985, Page 26 and you can make a new 40-track DOS by burning the modified code into a 68766 EPROM. Note: since the new OS-9 Level II for the CoCo 3 supports double-sided and higher capacity drives, I expect the next release of Disk Extended BASIC to support these drives.

CoCo Error-Trapping

I recently read an article about CoBBS in the November, 1985 issue of RAINBOW, and the subject of a program for error-trapping was discussed. How could I use error-trapping if I have Disk Extended Color BASIC using the RS-DOS chip? I've seen different brands of disk controllers that have error-trapping built in? Can I make error-trapping work on my CoCo?

Tim Fultz
Moncks Corner, SC

℞ In order for you to have the capability to use error-trapping on your CoCo, you would have to use a machine language subroutine to intercept the ROM vector at addresses $018E-$0190. An article "Trap That Error" by H. Allen Curtis, RAINBOW, August 1984, Page 61, supplies a BASIC program that pokes such a machine language program into memory for DOS 1.0. Patches for DOS 1.1 appear on Page 237 of the October 1984 issue. By the way, the new CoCo 3 has error-trapping built in with its `ON ERR GOTO` statement.

BASIC Cold Start

I have several disk utility programs that force BASIC to cold start, then load a program. One that comes to mind is Diskutil *by Jeff Francis. In this program, when you select the Load option, it cold starts to BASIC, and has BASIC load and run the file by injecting a statement like* `LOAD"THISFILE":RUN`. *Is there any way to do this from BASIC?*

Eric W. Tilenius
Huntington Station, NY

℞ A Disk BASIC program can cause another to be executed by simply including `RUN` *PROG2* in the first program where you want it to switch.

Hard Disk Setup

I have a 64K CoCo 2 with Disk Extended Color BASIC Version 1.1, and have recently purchased OS-9. I've been curious about the hard disks and dual DSDD drives I see advertised for the CoCo. If I get either the hard disk or the dual DSDD drives, do I need a different controller to access all these tracks? Do I also need a different controller to access both sides? Do I need modified cables? Does a 5¼-inch disk look logically like a 3½-inch and do they have the same number of tracks?

Bruce Corey
Bradenton, FL

Hint . . .

Baud Boy

If your printer is capable of accepting data at a higher baud rate than 600, or you just got that new serial-parallel converter and want to try it out, try the following poke. Location 150 in memory holds values which control how fast data is sent to your printer. The power-up value in this location is 87. If you want to change this, just enter

```
POKE150,X
```

where X equals one of the following values: 600 baud, 87; 1200 baud, 41; 2400 baud, 18; 4800 baud, 7; and 9600 baud, 1. If all you get is garbage, try adding or subtracting a value of one from the above values and re-poking them.

℞ Aside from the 5¼-inch single-sided drive #26-3131, Tandy also markets a double-sided, 5¼-inch 360K, 40-track drive (#25-1060), and a double-sided, 3½-inch 720K, 80-track drive (#25-1061), both of which (with modifications) are CoCo compatible. They will work with a standard CoCo controller, but require a new cable without missing teeth. Other drives worthy of consideration are TEAC's 55BV (40 tracks, 360K) and TEAC's 55F (80 tracks, 720K). All of these drives will work with Disk Color BASIC 1.0 or 1.1, but under Disk BASIC, they use only one side and 35 tracks. Note that if you are using one of the 80-track drives (5¼ inch or 3½ inch), you also need a 35- or 40-track drive to transfer software to the new media. If you want even higher capacity, but only for OS-9 (this drive will not work with BASIC), you have a wider choice. Weltec Digital in Anaheim, Calif., (714) 630-7020 markets an IBM PC-AT 1.2-Meg drive Model M16-P12 ($149) that has a special logic board that lets it feed off a standard controller. With it and OS-9, you could have 30 sectors/track and 80 tracks on each side for a total of 4,800, 256-byte sectors. Compare that to the standard 35-track, single-sided drive with its 630 256-byte sectors, a double-sided 40-track with 1,440 256-byte sectors, and a double-sided 80-track with 2,880 256-byte sectors. Tandy markets hard drives and a controller for the CoCo, but since this is not yet a mass market item, the price is still high.

Memory Poke Crashes

I have a converted 64K CoCo with two disk drives. When typing in the memory poke, `POKE25,6:NEW`*, I find that I cannot load anything from a disk. The disk starts to load, stops in the middle and the computer crashes. I have to shut down the machine to do anything else. Why? Is there a fix?*

Raymond Home
Billings, MT

℞ Use `POKE 25,14:POKE&HE00,0:NEW` for disk BASIC or you will overwrite disk BASIC's file buffers between $600 and $DFF.

Hi-Res Saves

How can I save a CoCo 3 high resolution picture display to disk?

℞ You can save/load CoCo 3 graphics displays using the following routines: `HISAVE` and `HILOAD`. To use `HISAVE`, you must return to the Width 32 mode, then run the program supplying a filename of up to eight characters. It then saves the 32K screen memory in four 8K increments with filenames *name*`/HR1`, *name*`/HR2`, *name*`/HR3` and *name*`/HR4`.

`HISAVE` routine

```
10 INPUT"NAME:";N$
20 FOR I=&H70 TO &H73
30 POKE &HFFA2,I
40 F$=N$+"/HR"+CHR$(I-64)
50 SAVEMF$,&H4000,&H5FFF,44539
60 NEXTI
70 POKE &HFFA2,&H7A
```

The `HILOAD` routine prompts you for the filename (up to eight characters, no extension) and the `HSCREEN` value, then loads the graphics into memory allowing you to view them as they load.

`HILOAD` routine

```
10 INPUT"NAME:";N$
20 INPUT"HSCREEN#";H
30 HSCREEN H
40 FOR I=&H70 TO &H73
50 POKE &HFFA2,I
60 F$=N$+"/HR"+CHR$(I-64)
70 LOADMF$
80 NEXTI
90 POKE &HFFA2,&H7A
```

One or both routines can be incorporated into your own programs, but be sure to exercise care that this code resides below Address &H4000. This can be assured by putting this code at the very beginning of your program except for a `GOTO` that branches around it. You can then `GOSUB` one of these routines to save/load a graphics display.

The routines `HISAVE` and `HILOAD` manipulate the Memory Management Unit (MMU) registers to move 8K increments of memory into the 6809's 64K address space so the `SAVEM` and `LOADM` routines can access it. I developed the following routine, `MAP/BAS`, in order to help understand how these registers worked; it should be equally useful to anyone writing code in BASIC or another language to use the additional memory in the CoCo 3. You can find a CoCo 3 memory map on Page 311 of the *Color Computer 3 Extended BASIC* manual.

`MAP/BAS` routine

```
1 PCLEAR1
10 PRINT"TASK 0 REG. MEM.
START":PRINT"REGISTER VALUE
PAGE ADDRESS"
20 FOR I=&HFFA0 TO &HFFAF
30 IF I=&HFFA8 THEN PRINT:PRINT
"TASK 1 REG. MEM. START":PRINT
"REGISTER VALUE PAGE ADDRESS"
40 X=PEEK(I)AND63
50 Y=X*&H2000
60 YH=INT(Y/65536)
70 YL=(Y-YH*65536)/4096
80 PRINT" ";HEX$(I);" ";HEX$
(PEEK(I));" ";HEX$(X)';"
";HEX$(YH);HEX$(YL);"000"
90 NEXT
```

For a quicker response, your questions may also be posted in the Forum section of RAINBOW's CoCo SIG on Delphi. In Forum, type `ADD` and address your questions to the username DOCTOR-ASCII. You may also send questions to DOCTORASCII via Delphi Mail

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A Review of the Personal 'Settings Profile'

By Cray Augsburg
Rainbow's CoCo SIGop

Recently, a handy feature was added to Delphi. This feature is a section where you can control how Delphi interacts with your terminal. It's called Settings and is very similar to the Settings feature found under Using Delphi just off the main menu. It allows you to change your communications parameters as well as set terminal options.

To get to this area, simply enter your personal Delphi Workspace from the CoCo SIG menu or from any database prompt. Then type `SET` and press ENTER. Now, if you don't have your system set for prompt level three (`/PR=3`), enter a question mark and you will see the following Settings menu:

```
BUSY-Mode                       PASSWORD-locked
DEFAULT-Menu                    SET-High-bit
DOWNLOAD-Line-terminators       SLASH-Term-settings
ECHO-Mode                       TERMINAL-Type
EDITOR                          TIMEOUT
KERMIT-SETTINGS                 UTILITIES
LENGTH(Lines/page)              WIDTH(Columns)
NETWORK-PARAMETERS              XMODEM-SETTINGS
PASSWORD(Change)                HELP
PROMPT-Mode                     EXIT
```

At first glance, some of these items look pretty complicated and rightly so. We will discuss some of the simpler selections this month and save the more complicated and esoteric items for a future installment. You are always invited to experiment with any of the options. However, unless you have some understanding of the impact a particular selection could make, don't fool with it!

Now, you may recognize that some items in this menu are available from nearly any prompt on Delphi. You can enter them as "slash" commands. For instance, you can type `/PR=3` to change your prompt level anywhere except Mail. You can also use `/W=XX` and `/L=YY` to alter the width and length of your particular terminal. The problem with these slash commands is that their effects are only temporary. Once you log off Delphi, the next time you log on, these commands have to be reentered into the computer. However, if you make the changes in your Settings area, they become a permanent part of your default profile and become immediately effective the moment you sign on.

As we discuss the various options,

DATABASE REPORT

October has been the month of the CoCo 3 here on the SIG. With its introduction, the SIG has been rapidly accumulating new files in the CoCo 3 and OS-9 databases.

In our CoCo 3 news database **Roy Crosby** (UNCLE) uploaded to us the image of the three Microware programmers who put their mugs inside the CoCo 3 ROM. **Jerome Kalkhof** (GRUMCLUB) gave us some thoughts comparing the CoCo 3 and the Commodore 128. **Art Flexser** (ARTFLEXSER) and I have begun to post a variety of patches and fixes for both the flawed CoCo 3 BASIC ROM and for third-party programs that initially were incompatible with the CoCo 3. Of greatest importance is the patch Art Flexser posted that describes how to fix *Telepatched Telewriter* to allow it to run on the CoCo 3. **Bill Jackson** (BILLJACKSON) gave us what will undoubtedly be the first of many "start-up" files for the CoCo 3 that accomplishes several fixes. I've provided some hardware information about the RGB signals of the CoCo 3 versus those of the Atari ST RGB A monitor. **Kevin Darling** (KDARLING) contributed some of his thoughts on compatibility issues. **Dave and Becky Matthews** (ADOBEPAGODA) gave us some demonstration graphics programs in BASIC. **Mike Himowitz** (HIMOWITZ) has contributed a utility for the CoCo 3. Art Flexser has given us some of what will be parts of the upcoming ADOS 3, including utilities for redefinition of the CLEAR key and for defeating the automatic `HCLS` done whenever a Hi-Res graphics mode is invoked.

Our OS-9 database has had its index of all its contents brought up to date by our tireless OS-9 section leader, **Dale Lear** (DALELEAR). **Ronald Cole** (RONALDCOLE) has given us an assembly language and OS-9-based program for printing 16 gray level pictures made with a DS-69 digitizer from The Microworks. It was based on an earlier RS-DOS BASIC utility supplied by **Bob Montowski** (GRAPHICSPUB). **Jay Truesdale** (JAYTRUESDALE) has given two essays, including a superb product review of the Disto 512K RAM disk as

---

Cray Augsburg is RAINBOW's technical assistant and has an associate's degree in electrical engineering. He and his wife, Ruth Ann, have two children and live in Louisville, Ky. His username on Delphi is RAINBOWMAG.

"When the system doesn't detect any activity from your terminal, it asks you to respond. If you don't do so within 30 seconds, you are automatically logged off."

keep in mind help is only a Delphi distance away. Just type `HELP` at the Settings menu. You will be greeted with a list of information about the Settings utility. Then you will be given the option to ask for help on any of the items in the menu.

Busy Mode

Entering the Busy Mode settings option allows you to set your default as either "busy" or "not busy." "Not busy" is the standard system default. By setting the default as "busy," you accomplish the same thing as if you had entered `/GAG` or `/BUSY` at other Delphi prompts. It stops the interruption of other users paging you or sending you messages with the `/SEND` command. It also eliminates the notifications that you have received a new mail message. To turn this default off, should you decide to set your default to busy, just enter `/NOGAG` at any Delphi prompt. Keep in mind, on the CoCo SIG, we prefer you set yourself as being busy only while you are reading mail or uploading/downloading. Other people may want to talk.

Default Menu

As the name of this selection implies, it allows you to set which menu you are first greeted with upon signing onto Delphi. The system default is Delphi's main menu or Main. You can set the default to the CoCo SIG by entering `GROUP COCO` (or just `GR CO`) using this selection. You can set this default for nearly any area on the system. Obviously, wise use of this selection can save you a great deal of time as well as reduce the number of keystrokes required to get to the SIG.

---

used under OS-9. **Greg Law** (GREGL) has given us directory utilities for multiuser OS-9 systems, and an automatic baud rate selecting version of *TSMON*. Kevin Darling has sent us some utilities for branching or looping within a shell procedure. He also has given us *MVERIFY*, a utility for speeding the process of updating the CRC of a module in memory. In addition, he has also given us a `DMODE` command similar to the `XMODE`, but for RBF drivers. **Wayne R. Sundstrom** (DRIFTER) has provided a *LOG* program that logs OS-9 shell activity. It is also a tutorial on how to patch the OS-9 shell with debugger. **Rick Adams** (RICKADAMS) has given us a command under OS-9 Level I Version 2.0 that sets up the output of the CoCo 3 to be fully monochrome, eliminating those ugly vertical stripes normally seen on a monochrome display.

In the Data Communications database, I've uploaded all of the graphics screens that constitute the original documentation for the *WEFAX* program published in RAINBOW, February 1985. **Lance Bannerman** (STARCOWBOY) has uploaded two lists of frequencies from all over the world one can listen to, to find *WEFAX* signals. I've also uploaded the source code for the *RTTY* program published in the November 1986 RAINBOW. **Emery Mandel** (EMANDEL) has given us *Dazzelterm* 2.2. **Michael Banks** (KZIN), the manager of the Science Fiction SIG on Delphi, has provided us with an updated list of CoCo BBS systems. **Brian Wright** (POLTER GEIST) has sent us an updated version of *ASCII Express* for the CoCo and another terminal program for the CoCo. **Don Hutchison** (DONHUTCHISON), in charge of database submissions, has given a patch for *Colorcom/E* that adds a `FREE` command for it. **Mike Ward** (MIKEWARD) has posted a patch that allows *Mikeyterm* 4.0 to run on the CoCo 3, but note that this patch does *not* allow use of either the Word-Pak or the intrinsic 40- or 80-column screen on the CoCo 3. That will have to wait for a new version of the program.

In the Utilities database **Andrew Ellinor** (CROPPER) has uploaded a disk utility, and **Earl Casper** (EARLCASPER) has sent us a *VDG Fix* program. **Marvin D. Peterson** (MAZO) has sent us a disk editing utility called *Disksave*. In the November database report, I erroneously credited Milt Webb with the encryption program. The program is actually courtesy of **Doug Masten** (DMASTEN). Sorry about that, Doug!

In the Games database, Emery Mandel has sent us an Adventure game titled *CoCo Club Adventure*. **Roger Smith** (SMUDGER) has given us three new game entries.

Our Music library continues to grow with new selections provided by **Derrick M. Kardos** (DTG), **Mark Raphael** (MARKRAPHAEL), **Loren J. Howell** (XENOS) and **Ray Wright** (RAYWRI).

In the Graphics database a new host of images has arrived. Brian Wright has been quite active this month, sending us some extremely fine digitized images converted over from other computer systems using a picture exchange protocol being developed in his area. He's also sent us a classic computer pinup girl image. Emery Mandel has provided a number of images, and a package that when downloaded and run produces a beautiful, animated fireworks display. **Ira Goldwyn** (IRAG) has again shared with us a dozen pictures from his immense library of digitized images. **Mark Kowit** (TOBOR8) has sent two more original pieces of digitizer art. Marvin Peterson, Derrik M. Kardos and Ray Wright, have also contributed this month.

Don Hutchison, our submissions chief, decided to collect a little detailed information on our database this month. It turns out we now have roughly a dozen megabytes of stored CoCo program, text, music and graphics data accumulated over the year we have been in operation. At this time, by far the two largest databases are our Graphics and our RAINBOW ON TAPE databases, which are nearly the same size, and which together account for over half of the total number of bytes we offer.

But times are changing. With the arrival of the CoCo 3, a greater emphasis will be placed on OS-9. Our OS-9 section is growing nicely already. However, over the next few months I expect an explosion of OS-9 material. This will be in large part due to our acquiring permission to post the entire contents of the OS-9 Users Group software library on Delphi. This library has, I am told, roughly five megabytes of data in it. We have just received the disks for the library, and will be sorting the material out and gradually posting it over a period of months.

I look forward to seeing continuing strong support for the CoCo 3 during this new year. Whether you seek tips on buying hardware and accessories for your CoCo, software to run, music to play, or images to view, the Rainbow Delphi CoCo SIG surely has something for you. See you there!

— Marty Goodman
(MARTYGOODMAN)
Delphi CoCo SIG Database Manager

Password Change

This item allows you to change your Delphi password. This should be done fairly frequently to ensure security of your Delphi account. You will be required to enter your present password and then enter the new password you have chosen. Then you will be asked to enter your new password again for verification. Your password must be at least six characters or numbers long, and should not contain any punctuation. Passwords will not appear on the screen as you type them in.

Prompt Mode

The Prompt Mode setting allows you to set the level of the prompts displayed by the system. Prompt Mode 3 tells the system to display a complete menu every time you enter an area on Delphi, while Prompt Mode 2 displays a single-line prompt listing the available commands. Experienced users will spend most of their time in Prompt Mode 1. This mode displays a one- or two-word description of the Delphi area you are in. It gives no clue as to available commands. This selection functions the same as `/PR=X` at other Delphi prompts, but your choice becomes a permanent part of your Delphi profile. It saves time to stay in Prompt Mode 1 and just enter a question mark when you need a menu for the present area. However, we suggest you go to Prompt Mode 3 about once a week. This is because the system software is ever-changing and you may miss out on some new additions because you didn't know they were there.

Editor

This selection allows you to choose which editor you want to use for creating files and editing messages. The system default is the EDT editor, a product of Digital Equipment Corporation. It is somewhat difficult to learn to use. More popular is a line editor called "Oldie," which uses simple slash commands. It seems to fit well in the Delphi environment. If you want to use the Oldie editor, just enter `OLDIE` under the Editor selection.

Width and Length

These items function just as `/W=XX` and `/L=YY` except that, as we've said before, the changes become a permanent part of your user profile. They will only change if you change them by rewriting them or using `/W` or `/L`. A handy tip with Length is that if you set your length to zero, you eliminate all the "More?" prompts. Just use CONTROL-S and CONTROL-Q to stop and start the screen scrolling as you like.

Timeout

Timeout is a handy new feature from Delphi. Let's say you are online late at night and your body decides to take a break. While you are examining the insides of your eyelids, Delphi is busy burning away your hard-earned dollars and you aren't even doing anything on the system. When the system doesn't detect any activity from your terminal, it asks you to respond. If you don't do so within 30 seconds, you are automatically logged off. Timeout allows you to change how long Delphi waits before asking you to respond. The system default is 10 minutes, but you can change it to whatever value is most convenient for you.

Utilities

The Utilities feature is particularly important because it can help you avoid problems as you experiment with your settings. Before you begin changing your default settings, you can enter the Utilities selection and save your current profile to a file in your Workspace. Then you can experiment with the confidence that you can later reload your standard settings file.

In Utilities, you have three options: List, Dump and Reload. With List, you can display a listing of your current settings; Dump saves your current profile to a file in your Workspace called `PROFILE.DMP`, which conveniently allows you to edit it there; and Reload reloads it after you have edited it or messed it up while you were experimenting.

There is also a special settings option called Key which is most useful for those who sign on to Delphi using different terminals. All users have a profile with a key of zero, the profile that is used each time you log on. But some users may want to have different profiles. The Key option allows you to set up additional profiles with keys of 1 to 9. Each profile key is saved with the command `/SAVE #`, and can be loaded with the command `/RESTORE #` at any time, from any area of the system.

As an example, for my CoCo with a Word-Pak I, I use a profile that has 80 columns and 22 lines selected. However, on occasion, I use a Tandy 200 so I can sit on the couch and watch my two kids. For this, I select Key 1, which is set up for 40 columns and only 14 lines. This makes it a lot easier to change, since I don't have to enter `/L` and `/W` commands.

You can `/SAVE` and `/RESTORE` keys from any prompt. Just make sure the settings you are currently using are the ones you want to save. Keep in mind, though, that any time you log on, your key will automatically be set to zero. Therefore, you will start up with the defaults you have chosen from the Settings area of your Workspace.

Free Time Offer

Delphi has announced an interesting special offer. Delphi members can receive $50 of online time if they have their Delphi name included on their business card or business letterhead. The user must send a sample to Delphi for verification. For more details, send Mail to NANCE, a Delphi employee.

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(Reviewed in RAINBOW April '86 issue, pg. 185)

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For greater convenience, your high scores may also be sent to us through the MAIL section of our new Delphi CoCo SIG. From the CoCo SIG> prompt, pick MAIL, then type `SEND` and address to: `EDITORS`.

★ Current Record Holder ● Shutout

ADVANCED STAR*TRENCH (THE RAINBOW, 7/86)	
3,960	★Maurice MacGarvey, Dawson Creek, British Columbia
2,300	Blain Jamieson, Kingston, Ontario
1,800	Chris Goodman, Baltimore, MD
ALPINE SLOPES (THE RAINBOW, 12/85)	
6,851	★Myriam Ferland, Trois-Rivieres, Quebec
4,656	Maurice MacGarvey, Dawson Creek, British Columbia
4,254	Todd Wirtz, Midland, MI
4,058	Johnny Garrison, Tuscaloosa, AL
3,970	Steven Bullard, Allen, OK
ANDRONE *(Radio Shack)*	
61,200	★Maurice MacGarvey, Dawson Creek, British Columbia
58,200	Scott Bellman, Bettendorf, IA
57,300	Mitch Hart, Seattle, WA
54,300	Daphnie Phillips, Evansville, WI
40,585	Theresa Juetten, Pelkie, MI
ASTRO BLAST *(Mark Data)*	
60,825	★Craig Schreder, Sarnia, Ontario
BAG-IT-MAN *(Aardvark)*	
358,000	★Kevin Krueger, 100 Mile House, British Columbia
BEAM RIDER *(Spectral Associates)*	
6,004,000	★James Oakley, Nashville, TN
3,376,080	Lisa Lapointe, La Tuque, Quebec
3,042,470	Evelyn Thompson, Nederland, TX
1,909,630	Paul Bivens, Washington, PA
747,200	Robert Eering, Swift Current, Saskatchewan
BIOSPHERE *(Radio Shack)*	
391	★Danny Perkins, Clifton Forge, VA
BOXING (THE RAINBOW, 8/86)	
480	★Talib Khan, Bronx, NY
395	Blain Jamieson, Kingston, Ontario
BUBBLE WARS (THE RAINBOW, 2/86)	
75,100	★Rachael Richards, Blakeslee, PA
43,150	Shirley Kirk, Elgin, OR
37,957	Odene Kirk, Elgin, OR
30,850	Daniel Cecil, Bardstown, KY
29,650	Carlton Taylor, Scarborough, Ontario
BUSTOUT *(Radio Shack)*	
37,900	★Gordon Rock, Davenport, IA
21,850	Charles Egglesfield, Sault Ste Marie, Ontario
21,630	Tanya Maestas, Denver, CO
21,236	Mike McCafferty, Idaho Falls, ID
18,403	Chris Zepka, North Adams, MA
CANYON CLIMBER *(Radio Shack)*	
60,000	★Debbie Wilcock, Mt. Carmel, PA
CASTLE (THE RAINBOW, 6/86)	
202,659	★Brendan Powell, La Grande, OR
116,606	Darryn Bearisto, New Carlisle, Quebec
55,239	John Broussard Jr., Alexandria, LA
10,216	Kirby Smith, York, PA
9,941	Maurice MacGarvey, Dawson Creek, British Columbia
CATERPILLAR CAVE *(T&D Software)*	
1,170	★Alex Abraham, Atlanta, GA
CHAMBERS *(Tom Mix)*	
180,900	★Blossom Mayor, East Greenbush, NY
CLOWNS & BALLOONS *(Radio Shack)*	
62,440	★Robin Ackerman, Concord, TN
41,280	Blake Cadmus, Reading, PA
COLOR BASEBALL *(Radio Shack)*	
999-0	★●Erik Munson, Tucson, AZ
866-1	Ghislain Chillis, Trois-Rivieres, Quebec
814-1	Frank D'Amato, Brooklyn, NY
814-0	●John Licata, Richton Park, IL
653-0	●Danny Perkins, Clifton Forge, VA
549-0	●Skipper Taday, East Lyme, CT
COLOR BLACKJACK (THE RAINBOW, 10/83)	
$26,500	★Francois Provencal, Chateauguay, Quebec
COLOR CAR *(NOVASOFT)*	
242,767	★Alan Martin, Cornwall, Ontario
110,454	Scott Enman, Belle-Mead, NJ
107,864	David Entenmann, Monroe, NY
COLORPEDE *(Intracolor)*	
317,476	★Nadine Bourgeault, Mississauga, Ontario
CRYSTLE CASTLES *(ThunderVision)*	
820,010	★J. Yosef Krinsky, Jerusalem, Israel
595,490	Candice Berger, Calgary, Alberta
DALLAS QUEST *(Radio Shack)*	
87	★Douglas Bell, Duncan, OK
89	Milan Parekh, Fullerton, CA
89	Andrew Urquhart, Metairie, LA
89	Steve Zemaitis, Howell, MI
90	Roy Grant, Toledo, OH
91	John Semonin, Akron, OH
92	David & Shirley Johnson, Leicester, NC
DEATH TRAP *(Soft Sector)*	
86,748	★Douglas Pardon, Brigham City, UT
47,233	Dale Krueger, Maple Ridge, British Columbia
40,674	David Entenmann, Monroe, NY
DECATHALON *(Spectral Associates)*	
10,304	★Bernard Florence, Croydon, Australia
9,648	Matthew Sunderland, Christchurch, New Zealand
9,344	Marco Lecours, Ste-Justine, Quebec
DEMOLITION DERBY *(Radio Shack)*	
110,500	★Tim Glenn, Havertown, PA
97,700	Brian Ballew, Morganton, NC
DEMON ATTACK *(Imagic)*	
244,110	★Gregory Day, Holstein, Ontario
125,520	Mike Watson, Northville, NY
81,635	Tim Glenn, Havertown, PA
78,010	Lisa Nebel, Phoenix, AZ
64,195	Jon Ruhnow, Duncanville, TX
DEMON SEED *(MichTron)*	
15,360	★Blake Cadmus, Reading, PA
DESERT PATROL *(Arcade Animation)*	
746,450	★Rodney Abery, Victoria, Australia
DESERT RIDER *(Radio Shack)*	
68,872	★Janine Freamon, Citrus Heights, CA
65,215	Skip Freamon, Citrus Heights, CA
62,329	Steve Zemaitis, Howell, MI
51,519	Michael Lizardy, Oregon, OH
50,268	Bernard Florence, Croydon, Australia
40,721	Fiona Robertson, Hackett, Australia
DOODLEBUG *(Computerware)*	
2,515,940	★William Novobilsky, Lanoka Harbor, NJ
1,315,170	Doreen Watt, Sudbury, Ontario
400,820	Blossom Mayor, East Greenbush, NY
52,430	Craig Schreder, Sarnia, Ontario
18,385	Blake Cadmus, Reading, PA
DOUBLE BACK *(Radio Shack)*	
2,586,300	★Eugene Roosa, Stone Ridge, NY
1,618,400	Diane Guernon, Montreal, Quebec
450,600	Michael Brennan, Calgary, Alberta
159,610	Blake Cadmus, Reading, PA
52,840	Joel MacNeil, Needham, MA
22,600	Samuel Wilcock, Mt. Carmel, PA
DOWNLAND *(Radio Shack)*	
89,490	★Neil Edge, Williston, FL
77,254	Tom Audas, Fremont, CA
70,142	Chris Goodman, Baltimore, MD
68,142	Cooper Valentin, Vavenby, British Columbia
49,500	Danny Perkins, Clifton Forge, VA
DRACONIAN *(Tom Mix)*	
760,549	★Conan Davis, London, Ontario
157,310	Mark Bourgeault, Mississauga, Ontario
DRAGON FIRE *(Radio Shack)*	
123,120	★Rupert Young, Sheffield, MA
46,713	Gilles Gagne, Sillery, Quebec
33,676	Nathanael Heller, Kenner, LA
30,720	Brian Matherne, Gretna, LA
21,221	Jermaine Jackson, Tallulah, LA
ENCHANTER *(Infocom)*	
400/621	★Brad Wilson, Lithia Springs, GA
185/186	David Tarleton, Williamsburg, VA
80/115	Scott Bellman, Bettendorf, IA
EVICTOR (THE RAINBOW, 7/86)	
9,230	★Raymond MacGarvey, Dawson Creek, British Columbia
7,500	Rachael Richards, Blakeslee, PA
4,570	Chris Goodman, Baltimore, MD
FALCON'S LAIR (THE RAINBOW, 8/85)	
30,522	★Kirby Smith, York, PA
19,554	Talib Khan, Bronx, NY
18,461	Joyce Smith, Butler, PA
17,463	Michael Scott, Johnstown, NY
15,707	Daniel Cecil, Bardstown, KY
FIGHTER PILOT *(Saguaro Software)*	
117,000	★Stevphan Arvay, St. Louis, MO
61,500	Steven Arvay, St. Louis, MO
FIRESTORM (THE RAINBOW, 1/86)	
3,510	★Brad Bansner, Wyomissing, PA
FROGGIE *(Spectral Associates)*	
34,540	★Richard Nieves, Mayaguez, Puerto Rico
FROG-MAN *(Computer Island)*	
6,635	★Andy Green, Whitehall, PA
GALAGON *(Spectral Associates)*	
73,520	★Neil Edge, Williston, FL
71,220	Debora Edwards, Wembley, Alberta
GANTELET *(Diecom Products)*	
2,011,200	★Jerry Colbert, Bakersfield, CA
787,780	Brad Wilson, Lithia Springs, GA
628,020	Mike Dyer, Lompoc, CA
243,810	Jay Graddick, Cocoa, FL
73,460	John Straiton, Merritt Island, FL
GATES (THE RAINBOW, 8/86)	
600	★James Donegan, Saugerties, NY
GHANA BWANA *(Radio Shack)*	
693,830	★Steve Wright, Fredericton, New Brunswick
510,160	Milan Parekh, Fullerton, CA
459,930	Gene Wells, Silsbee, TX
359,080	Mike Dyer, Lompoc, CA
325,900	Rupert Young, Sheffield, MA
300,000	Leon Kornbluth, Richfield, NJ
GHOST GOBBLER *(Spectral Associates)*	
102,540	★Greg Erickson, Lowell, MA
80,550	Olga Pichard, Lausanne, Switzerland
76,900	Ghislain Chillis, Trois-Rivieres, Quebec
76,900	Pierre Pichard, Lausanne, Switzerland
72,960	Sylvain Castonguay, Chicoutimi, Quebec
47,200	Mark Herpst, San Diego, CA

SCOREBOARD

GRABBER *(Tom Mix)*
182,100 ★Blossom Mayor, East Greenbush, NY
23,550 Rod Kruetzfeld, Vanscoy, Saskatchewan
GRID FACTOR *(T&D Software)*
4,550 ★Alex Abraham, Atlanta, GA
HITCHHIKER'S GUIDE TO THE GALAXY *(Infocom)*
400/722 ★Brad Wilson, Lithia Springs, GA
HYPERZONE *(Computerware)*
16,230 ★Richard Nieves, Mayaguez, Puerto Rico
JUNIOR'S REVENGE *(Computerware)*
1,210,400 ★Ryan Sharp, Pompano Beach, FL
KAMAKAZIE KAR (THE RAINBOW, 8/85)
75.75 ★Tim Glenn, Havertown, PA
KARATE *(Diecom Products)*
24,400 ★Robbie Cross, Starkville, MS
11,000 Gilles Melanson, Sudbury, Ontario
10,900 Jim Doyle, Barrackville, WV
9,900 Scott Enman, Belle-Mead, NJ
4,200 Scott Bellman, Bettendorf, IA
THE KING *(Tom Mix)*
4,092,600 ★Fruber Malcom, Culpeper, VA
2,134,600 Tim Rueb, Stevensville, MI
1,670,900 Yolanda Farr, Sayre, PA
1,500,800 Kevin Cornell, Greentown, IN
219,700 Rodney Abery, Victoria, Australia
KNOCK OUT *(Diecom Products)*
181,085 ★Rush Caley, Port Orchard, WA
168,385 John Licata, Richton Park, IL
149,190 Daniel Lesage, Laval, Quebec
137,900 John Rogers, Rye, NH
135,825 Ghislain Chillis, Trois-Rivieres, Quebec
KUNG FU FIGHTER (THE RAINBOW, 3/86)
890 ★Brian Matherne, Gretna, LA
LEMANS *(Spectral Associates)*
0:53 ★Robert Eering, Swift Current, Saskatchewan
0:93 Stephen Mills, Swift Current, Saskatchewan
LUNAR-ROVER PATROL *(Spectral Associates)*
403,950 ★Rodney Abery, Victoria, Australia
142,600 Jerry Rossano, Manassas, VA
MARBLE MAZE *(Diecom Products)*
36,354,780 ★Melvin Sharp Jr., Baltimore, MD
186,560 Neil Edge, Williston, FL
106,950 Dan Bouges, Niantic, CT
104,130 Jeff Maxwell, Lincoln, NE
103,560 Stephane Ouzilleau, Lauzon, Quebec
MEGA-BUG *(Radio Shack)*
20,941 ★Shelby Dunning, Sacramento, CA
18,874 Tim Rueb, Stevensville, MI
17,250 Keith Queen, Marietta, GA
14,861 Michael Clerico, Seaford, NY
14,785 Blain Jamieson, Kingston, Ontario
MINIGOLF (THE RAINBOW, 5/86)
23 ★Wilfrid Sloan, Newport-on-Tay, Scotland
MISSION: F-16 ASSAULT *(Diecom Products)*
127,550 ★Michael Heitz, Chicago, IL
38,305 Richard Nieves, Mayaguez, Puerto Rico
34,670 Chris Foster, Texarkana, TX
29,600 Jeanine Mason, Spencer, MA
19,900 Stevphan Arvay, St. Louis, MO
MONSTER MAZE *(Radio Shack)*
207,800 ★Kenneth Kirby, Murphy, NC
MR. DIG *(Computerware)*
10,416,315 ★Paula James, Lumberton, TX
MUDPIES *(MichTron)*
354,800 ★Sal Scibetta, Houston, TX
246,600 Terry Kreller, Winnipeg, Manitoba
127,200 Lisa Kohn, Canton, OH
108,800 Eddie Roginski, Mertztown, PA
96,700 Dale Krueger, Maple Ridge, British Columbia
NINJA WARRIOR *(Programmer's Guild)*
1,011,900 ★Vivian Buterin, St. John, MO
753,000 Rich Fiore, Clemson, SC
181,200 Robert Mercredi, Winnipeg, Manitoba
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108,000 Eric Gladstone, Ocala, FL
OFFENDER *(American Business Computers)*
215,000 ★Andrew Urquhart, Metairie, LA
ONE-ON-ONE *(Radio Shack)*
1,006-57 ★Elliot Alfred & Ian Hanson, Houston, TX
994-24 Mark Berry, Durham, Ontario
994-28 Chad Johnson, Little Rock, AR
986-22 Toby Jacobs, Bellefontaine, OH
970-32 Wes Hill, Vashon, WA
969-0 •Erik Huffman, Rochester Hills, MI
OPERATION FREEDOM (THE RAINBOW, 8/85)
33,320 ★Blain Jamieson, Kingston, Ontario
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PAC-TAC *(Computerware)*
39,853 ★Andy Green, Whitehall, PA
PAPER ROUTE *(Diecom Products)*
511,000 ★David Kauffman, South Haven, MI
337,550 Lawrence Elman, Smithtown, NY
249,000 Jami Foster, Maryville, TN
200,305 Michael Heitz, Chicago, IL
106,000 Martin Parada, Arcadia, CA
PEGASUS AND THE PHANTOM RIDERS *(Radio Shack)*
250,200 ★Leon Kornbluth, Richfield, NJ
187,300 Mike Grant, Fresno, CA
109,800 Mike Dyer, Lompoc, CA
63,890 Milan Parekh, Fullerton, CA
50,200 Rodrigo Maldonado, Whittier, CA
PITFALL II *(Activision)*
199,000 ★Kirk Lockhart, Waco, TX
199,000 Danny Perkins, Clifton Forge, VA
198,252 Tom Audas, Fremont, CA
194,000 Michael Wallace, Bronx, NY
187,900 Thomas Audas II, Fremont, CA
173,884 Brian Biggs, Grove City, OH
PITSTOP II *(Epyx)*
54 ★James Doty, Washougal, WA
54 ★Danny Perkins, Clifton Forge, VA
15 Randy Heckman, La Mirada, CA
9 Walter Hearne, Pensacola, FL
9 Jeff Maxwell, Lincoln, NE
POLARIS *(Radio Shack)*
81,724 ★Gene Murphy, Ft. Worth, TX
POLAR TIC TAC TOE (THE RAINBOW, 8/86)
12 ★Chris Goodman, Baltimore, MD
POOYAN *(Datasoft)*
97,500,000 ★Rich Fiore, Clemson, SC
3,785,000 Ben Collins, Clemson, SC
1,987,000 Jon Sowle, Sanford, FL
1,546,000 Jason Maxwell, Manchester, TN
1,253,200 Thomas Mayor, Brooklyn, NY
POPCORN *(Radio Shack)*
165,180 ★Matt Heinemann, Richmond, VA
116,630 Keith Aschemeier, Napoleon, OH
57,680 Melita Boudreault, Port-Cartier, Quebec
56,500 Bruce Johnson, Vavenby, British Columbia
50,210 Scott Swedis, Spencer, MA
PYRAMID *(Radio Shack)*
220/220 ★Craig Fricke, Jacksonville, IL
QUIX *(Tom Mix)*
1,404,000 ★Curtis Goodson, Sao Paulo, Brazil
1,003,104 Elisa Goodson, Sao Paulo, Brazil
RADIO BALL *(Radio Shack)*
6,330,350 ★Myriam Ferland, Trois-Rivieres, Quebec
4,510,740 Les Dorn, Eau Claire, WI
1,945,110 Dominic Deguire, St. Basile, Quebec
1,330,500 Sara Grace, Baltimore, MD
1,301,350 Brian Matherne, Gretna, LA

ROBOTTACK *(Intracolor)*
2,122,150 ★Ghislain Chillis & Michel Lessard, Trois-Rivieres, Quebec
1,020,800 Ian MacLachlan, Bethany, Ontario
975,850 Erik Huffman, Rochester Hills, MI
931,250 Keith Smith, Bethany, Ontario
637,600 Chad McClellan, Rushville, IN
ROMMEL 3-D *(MichTron)*
499,400 ★Stephen Charchuk, Yarmouth, Nova Scotia
144,600 Jim Hawerbier, Elmhurst, IL
84,000 Todd Hooge, Comox, British Columbia
68,200 Marc Gagnon, Cap-de-la-Madeleine, Quebec
62,700 Paul Seng, East Lansing, MI
SAILOR MAN *(Tom Mix)*
997,300 ★John Licata, Richton Park, IL
983,300 Gabriel Assel, Cameron, MO
910,200 Mike McGeoch, Havertown, PA
879,100 Alan Drazen, Longwood, FL
741,100 Bryan Jenner, Calgary, Alberta
SALVAGE OF THE ASTRONAUTS (THE RAINBOW, 9/86)
4,830 ★Chris Goodman, Baltimore, MD
793 Spencer Metcalf, Longview, TX
SANDWORM (THE RAINBOW, 8/86)
830 ★Brian Matherne, Gretna, LA
SHAMUS *(Radio Shack)*
190,280 ★Damon Sunderland, Christchurch, New Zealand
88,960 Mike McGeoch, Havertown, PA
27,510 Craig Schindler, Cambridge, Ontario
27,285 Thomas Hunt, Oxon Hill, MD
24,000 Frank Pruet, San Diego, CA
SHENANIGANS *(Mark Data)*
90 ★Roy Grant, Toledo, OH
90 ★Jeff Hillison, Blacksburg, VA
90 ★Paul Maxwell, Vancouver, British Columbia
95 Ed Emelett, Nanticoke, PA
95 David Kay, Winnipeg, Manitoba
SHOCK TROOPER *(Mark Data)*
214,203 ★Fruber Malcom, Culpeper, VA
150,490 Erik Huffman, Rochester Hills, MI
100,040 Rodney Mullineaux, Gig Harbor, WA
69,328 Gordon Alvarnaz, Taunton, MA
50,782 Tim Peysar, Pasadena, CA
SIR EGGBERT JUMPER (THE RAINBOW, 8/85)
568 ★Odene Kirk, Elgin, OR
SKIING *(Radio Shack)*
0:45.65 ★Tim North, Emporia, KS
0:49.45 Sam Zehel Jr., Coal Center, PA
0:56.00 Jason Munson, Tucson, AZ
0:56.00 Leslie Sherman, Shallowater, TX
1:00.00 Scott Clevenger, Fairmount, IN
1:00.00 Billy Fairfull, Charleston, SC
1:10.00 Kevin Gallagher, Santa Monica, CA
SLAY THE NERIUS *(Radio Shack)*
329,335 ★Tom Audas, Fremont, CA
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10,120 ★Kenneth Kirby, Murphy, NC
SPEED RACER *(MichTron)*
145,400 ★Brian King, Orlando, FL
142,720 Erik Huffman, Rochester Hills, MI
142,310 Kevin Cornell, Greentown, IN
142,100 Chris Harrison, Brooks, KY
139,210 Alan Drazen, Longwood, FL
SPIDERCIDE *(Radio Shack)*
2,550 ★Charles Marlow, Briarwood, NY
2,000 Mike Watson, Northville, NY
1,740 Joel DeYoung, Manson, Manitoba
1,730 Jason Munson, Tucson, AZ
1,540 Blake Cadmus, Reading, PA
STAR BLAZE *(Radio Shack)*
9,350 ★Michael Shahan, Bloomington, IN
8,750 Jon Larson, Seligman, AZ
8,750 Kent Pirkle, Cumming, GA
8,400 John Guptill, Columbia, MO
8,200 Chris Coleman, Meriden, CT
8,100 Curtis Frazier Jr., Enterprise, AL
7,650 Christian Keyes, Stroud, Ontario
STARLORD (THE RAINBOW, 8/86)
452,880 ★Brad Bansner, Wyomissing, PA
213,180 David Bartmess, Fayetteville, PA
92,220 Christian Keyes, Stroud, Ontario
65,280 Wilfrid Sloan, Newport-on-Tay, Scotland
51,195 Mark Glover, Derby, NY
STELLAR LIFE-LINE *(Radio Shack)*
347,420 ★Steven Smith, Matthews, NC
299,030 William Novobilsky, Lanoka Harbor, NJ
78,600 Don Johnson, Winnipeg, Manitoba
58,580 Stefan Mecay, Austin, TX
49,900 Craig Fricke, Jacksonville, IL
STRATEGY FOOTBALL (THE RAINBOW, 8/83)
124-7 ★Thomas Laubach, Jacksonville, FL
TEMPLE OF ROM *(Radio Shack)*
1,422,400 ★Timothy Bishop, Jacksonville, FL
959,400 Sonya Hurst, Richmond, CA

938,800	Christopher Romance, Massapequa Park, NY
250,600	Thomas Audas II, Fremont, CA
219,300	Maurice MacGarvey, Dawson Creek, British Columbia
131,100	Brian Matherne, Gretna, LA
THE TOUCHSTONE *(Tom Mix)*	
73,520	★Mark Bourgeault, Mississauga, Ontario
TUBE FRENZY *(Aardvark)*	
181,930	★Sheryl Chapnick, Winnipeg, Manitoba
VARLOC *(Radio Shack)*	
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1,850	Michael Batalon, Ninole, HI
1,850	Wayne Edwards, Wembley, Alberta
VICIOUS VIC (THE RAINBOW, 7/86)	
2,626	★Brad Bansner, Wyomissing, PA
2,512	Jeff Brudereck, Wyomissing, PA
1,201	Maurice MacGarvey, Dawson Creek, British Columbia
THE VORTEX FACTOR *(Mark Data)*	
100/483	★Rick & Brenda Stump, Laureldale, PA
WHIRLYBIRD RUN *(Spectral Associates)*	
31,300	★Martin Parada, Arcadia, CA
ZAXXON *(Datasoft)*	
2,061,000	★Byron Alford, Raytown, MO
1,300,500	Dan Brown, Pittsford, NY
1,100,600	Andrew Urquhart, Metairie, LA
256,400	Blake Cadmus, Reading, PA
253,400	Bob Dewitt, Blue Island, IL
52,000	Jesse Ross, Rochester, NY
ZONX (THE RAINBOW, 10/85)	
21,100	★Phillip Johnson, Scottsville, VA
15,100	J. Yosef Krinsky, Jerusalem, Israel
14,900	Christian Keyes, Stroud, Ontario
14,300	Dale Taylor, Chattanooga, TN
13,600	Michael Etchason, Sauk Rapids, MN

— Jody Doyle

SCOREBOARD POINTERS

In conjunction with THE RAINBOW's Scoreboard, we offer this column of pointers for our game-playing readers' benefit. If you have some interesting hints and tips, we encourage you to share them by sending them to the Scoreboard, c/o THE RAINBOW.

FEEDBACK

Scoreboard:

In response to the letter from Frank Heezen in the October 1986 issue, the gunk in *Zork I* is a tube of glue that can be used to repair any holes in the inflatable boat. You have to use the boat to travel down the river to recover a treasure, but if you do not take any sharp objects in the boat with you, there will probably be no holes and you will not need the glue.

Richard King
Plymouth, IN

BOXED IN

Scoreboard:

You can go beyond 999,999 in playing *Quix*. When you pass one million, the screen rolls over a few times and the counter resets to zero.

Here is a simple technique to catch the two snakes: Make a lot of small boxes along the margins, as closely spaced as possible, but without touching one another. A snake will eventually enter the space between two boxes, and will be unable to come out again. Then just close off that space at your leisure.

Curtis C. Goodson
Campinas, Brazil

THE CRACKED CRYPT

Scoreboard:

I have finally solved *The Martian Crypt*! Here are some pointers:

The magic word is "amore." When you cross the pit ask for help. Go into the water, go South, then West, get the crown and go East, North, North. Give the crown to the sage for another riddle. Pry the plaque with the stalactite. Then go East and fly over the cracks in the floor and throw the stalactite at the wraith. To open the big doors throw a red gem. Once inside, ask for help.

If anyone knows how to cross the bridge in *Trekboer*, please send help. I have tied the rope to the tree east of the bridge. But it doesn't work.

David Merkel
Houston, TX

PYRAMID PUZZLE

Scoreboard:

In *Pyramid* I have everything but the coins and remaining treasure. How do I get them? PLUGH does not seem to change the game (as far as I can tell).

Also in *Zork I* I can't find the altar, dispose of the granite wall in the slide room or figure out what to use to exorcise in the tiny cave room. If you have the red buoy, use it to hide your valuables from the thief and the other guy. Please send help to "Scoreboard."

Dale Lampe
Sacramento, CA

DON'T JUMP SHIP

Scoreboard:

I need help on the Adventure *The Stowaway* from *The Second Rainbow Book of Adventures*. I have searched the whole ship, found the power box on the wall behind the coal pile and thrown the switch. Also, I have found the message on the ceiling and moved the compass handle. Where do I go from here? Any help would be appreciated.

William R. Graham
Swedesboro, NJ

DID I MISS SOMETHING?

Scoreboard:

I've just solved *Bedlam* in one sitting of about half an hour. I had fun with it but it ended too soon. Does anybody know of any other exits besides the kennel?

A hint for *Bedlam*: Drop the hook before you feed the dog the meat with the pill inside it.

Erick Molnar
Reno, NV

AXE-ING FOR HELP

Scoreboard:

I'm having trouble with *Blackbeard's Island*. After I get the string, I go back through the path in the underbrush. Then I go to the dock and fish for the anchor. When I go back to the underbrush, I can't get through. It tells me the underbrush is too thick! Since my axe broke I can't cut another pathway. Can anybody help? Please write to the "Scoreboard."

David Solley
Elyria, OH

BOGGED DOWN IN *BEDLAM*

Scoreboard:

I can't find how to get around the serpent in *Pyramid 2000*. I also haven't found out how to get over the rug in *Raaka-Tu*, or how to get the green key and red key in *Bedlam*. Any help would be appreciated.

Sam Waldrop
Brownwood, TX

SUPREME FLASK SURPRISE

Scoreboard:

I am stumped on *Kingdom of Basham*. I can't get off the mountain road. In *Sands of Egypt*, I can't even find the pyramid let alone get in.

While playing *Dungeons of Daggorath* I came across a supreme flask which I could pick up, but was unable to use. I have owned the game for several years and never encountered this before. Any help would be greatly appreciated.

Joseph J. McElheny
Pensacola, FL

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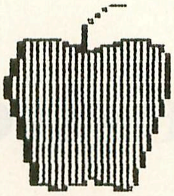
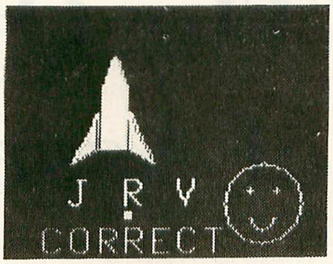


PreReader



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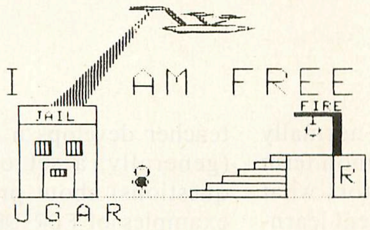

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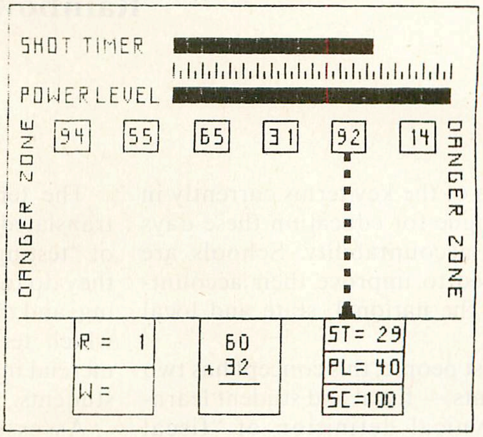

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The Question of Assessment

By Michael Plog, Ph.D.
Rainbow Contributing Editor

One of the key terms currently in vogue for education these days is accountability. Schools are being asked to improve their accountability at the national, state and local levels.

For most people, this concept has two components — fiscal and student learning. A cynical definition of "fiscal accountability" is that schools are asked to do more with less money. Fiscal accountability is most often raised as an issue by people who want to reduce school budgets. However, the main topic of interest here is not fiscal accountability, but accountability of student learning. We will leave the idea of fiscal responsibility for later.

Accountability for student learning is closely tied to the idea of assessment. With proper assessment, so goes the argument, schools will be accountable for the knowledge students acquire, and will be able to identify areas of weakness that need improvement.

The term "assessment" is normally translated into the more common term of "testing." Ask most educators what they do for assessment of student learning, and they will respond by telling you which tests (often standardized commercial instruments) they administer to students.

Assessment, however, is a much broader concept than testing. Testing has come to mean paper and pencil instruments, where a student is presented with one question at a time and must provide one answer at a time. The answer is either right or wrong. Assessment, on the other hand, is generally used by educators to indicate a full evaluation of student abilities and knowledge.

There are arguments about the merits of testing. My personal opinion is that testing is a very poor way of determining what a student knows, but a very easy way of getting a lot of information about a lot of students in a short time. The *value* of that information is what raises questions about the merits of testing.

For example, consider the problem of a teacher who wants to determine how well students have learned programming a computer in BASIC. One option for this teacher is the test option. The teacher develops a series of questions (generally, a set of multiple choice questions) about programming terms, examples of `FOR-NEXT` loops, how to use commands such as `RESTORE`, `LINE`, `PMODE`, `CLOAD`, etc. Students answer the questions. Each question is assigned one correct response, and the total number of correct responses is used to obtain a score for each student. This score is then interpreted to indicate how much students know about programming.

Unfortunately, this activity is not the best way for a teacher to determine how well students have learned BASIC programming. The obvious "best" way is for the teacher to assign a task to be completed on the computer. Students would have to program the machine to complete the task. If a student's program does not perform the task required, the teacher can clearly state that student does not know how to program the computer. If the computer does indeed perform the task required, the student has demonstrated knowledge about BASIC programming. The level of difficulty of the task to be performed should relate to the level of knowledge of the students. For a beginning programmer in the lower grades, the task may be to input and print names of

---

Michael Plog received his doctorate degree from the University of Illinois. He has taught social studies in high school, worked in the central office of a school district and is currently employed at the Illinois State Board of Education.

classmates. For an advanced programmer in high school, the task might be to create a database for class attendance and grades.

Although it is entirely possible to conduct a good assessment program without a computer, it is impossible to provide a large scale testing program without some computerized assistance. Computers are used for testing in two basic ways.

The first way is to use the computer instead of paper and pencil. In this type of computer use for testing, a student is given a question on the computer screen instead of on a piece of paper. The student presses a key instead of writing an answer or marking a space on an answer sheet. The computer keeps track of all responses, scores the responses as right or wrong, gets a score for the student, and can even compare each individual student with all other students taking the test.

In this application of the computer to testing, we have simply replaced one technology with another. The computer is merely eliminating a few steps in the process. The questions need not be any different if shown on the screen than on a piece of paper. This application does allow some flexibility not available with pencil and paper tests. For instance, the order of questions can be arranged in different sequences, depending on answers to previous questions. In general, however, this use of the computer is not much different than a paper and pencil test.

Another way of using the computer for testing is management of test information. Computers can be used to score tests. Most commercial tests, and a growing number of locally developed tests, use "mark sense" answer sheets. Students darken a "bubble" on the sheet, and an electronic device records that mark as the answer. This scoring technique is much faster than having humans score the responses, with an error rate close to what humans would do. (All test scoring has error.) Schools can purchase small "readers" that score the mark sense answer sheets and transfer the information through a standard RS-232 port. (This is about the same as using your RS-232 to communicate with Delphi. You are just communicating with the reader.)

In addition to scoring the test, another component of management of test information is the analysis of the test instrument. Analysis of test information involves two parts. First is the analysis of the items making up the test. Each item (question) can be examined by two characteristics: how well it relates to the test as a whole, and how well it performs by itself. A test composed of items showing good item characteristics is said to have strong reliability.

> ***". . . widespread student testing is simply impossible without the use of computers."***

The second part of analysis of test information deals with the analysis of groups of students. Students may be compared with each other or to some predetermined criterion of success as measured by the test.

Thus, widespread student testing is simply impossible without the use of computers. The mathematics involved in determining item characteristics and analyses of groups of students is too prohibitive without the speed of electronic machines. If it were not for computers, very few national commercial test instruments would be available for purchase, and those would be extremely expensive. With computers, tests can be constructed and analyzed by local school districts.

So much for the testing concept. Now, let's return to the more important concept of assessment rather than group testing. Do computers have a role to play here?

One problem in this area is that the state of the art of full assessment is not as advanced as testing. Assessment has traditionally been left up to individual teachers providing judgments about individual students. Teachers have used a variety of ways to determine student knowledge, including assigning tasks for students to perform, observing behaviors of students, and listening to students discuss detailed points about concepts learned.

It is entirely possible to use computers for assessment just as you would use them for any other educational activity. Students can be asked to express their knowledge in written form on a computer, or show they understand some concept by addressing it with assistance from the computer. These activities, however, are simply replacing other technologies with the computer. It is the same situation as having students take a test on the computer instead of using paper and pencil. We still know very little about the broader concept of assessment of determining student knowledge. We need more study in this field — more work by people at all levels of education.

There are several test companies today selling standardized test instruments for school use. All make liberal use of computers for test analysis. All use the weaker concept of testing; none (to my knowledge) use the more appropriate concept of assessment. If you have found a way to use computers to determine student knowledge (not dealing with testing, which only measures how well students can take a test), please share your information with others. I, especially, would like to hear from you. If anyone wants to write, my address is 829 Evergreen, Chatham, IL 62629.

One-Liner Contest Winner . . .

Here is a good way to alleviate frustration. Get your hands on a dart pistol. Then run this program to add the finishing touch.

The listing:

```
10 PMODE4,1:SCREEN1,1:PCLS:FORY=
1TO3:X=X+30:CIRCLE(128,96),X:CIR
CLE(128,96),10:DRAW"BM128,96;E3G
6E3H3F6":DRAW"BM108,96;U3R3D3L3R
3D3L3U1":DRAW"BM83,96;R3U3L3D6R3
U3":DRAW"BM55,95;U2L3R4L1D2L1D2L
1D2":NEXTY:FORZ=1TO999999:NEXTZ
```

Matt Blue
Columbus, IN

(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book of Simulations* and its companion *The Rainbow Simulations Tape*.)

64K ECB

DOWNLOADS

Typographical Errors Bring Confusion

By Dan Downard
Rainbow Technical Editor

• *I recently bought the* TRS-80 Color Computer Assembly Language Programming *book. As I was paging through it I found an assembly language program for a music synthesizer, and as I began typing it in, I came upon two lines that required left arrows. When I pressed* SHIFT-UP ARROW, *nothing happened; the cursor just sat there.*

I can get a left arrow while in BASIC, *but not while in assembly.*

The two lines look like this:

```
00310 MUS005 LDA ↑ ENVPTR ←
GET VALUE
00460        LDA ↑ ENVPTR ←
DUMMY
```

Craig Leininger
Moorhead, MN

Craig, you indeed found a typo in *TRS-80 Color Computer Assembly Language Programming*. The up and left arrows you refer to are probably misprinted control codes. If you look at the rest of the listing you will see that `ENVPTR` is the label for an envelope table at address $3F69.

• *I recently ran across* Rainboard *in the November 1983 issue. Instead of purchasing* RemoTerm, *I typed in Dan Downard's terminal driver program contained in that issue, as instructed by the author of* Rainboard.

When the program was executed I noticed the caller's BREAK *key wasn't disabled at all. I came to the conclusion that the poke given in* Rainboard*'s start-up routine was geared for* RemoTerm *only. What poke could I use to disable the caller's* BREAK *key in the terminal driver program?*

Allen Drennan
Sonora, CA

If you have an RS-232 Program Pak you can try using *REMOTE232*, which appeared in the November 1986 issue of THE RAINBOW. If not, Allen, try *REMOTE2* in the November 1985 issue. Both of these programs are rewrites of the original program with a few bells and whistles.

• *In your September column, you answered a letter from Mr. Richardson regarding two problems with OS-9. Several years ago, when I first purchased OS-9, I had a similar problem with the* `format` *command. When I tried to format a disk, it would format the first several tracks, however, it would eventually crash and lock up the system. Since the drives were fairly new, I had the Radio Shack technician examine them. He told me it was a defective controller board since he couldn't adjust the board to work. I believe Mr. Richardson might be well off to check his controller.*

William Strutts
Burton, MI

Thanks for your help, William. This adjustment could indeed be the problem. As I have said before, Radio Shack should get better grades for their service staff.

• *I have a 64K Disk Extended* BASIC *CoCo with* BASIC *Version 1.2, Extended* BASIC *Version 1.1, Disk* BASIC *Version 1.0 and an Epson MX/80 Plus printer.*

Recently, I bought Graphic Screen Print Program *(GSPRE) from Custom Software Engineering, Inc. for my CoCo and printer. This program only works on the cassette base; if possible, please tell me the proper procedure so I can use it with my disk base.*

Tho Luong P.
Flushing, NY

All you have to do to use the screen dump program with disk is transfer it from cassette to disk. Without having the *GSPRE* program I can't tell you the exact ending address, but if you have a tape-to-disk transfer program it will happen automatically. If you don't, after loading the program from cassette try:

```
SAVEM"GSPRE",&H7DD0,
&H7FFF,&H7DD0
```

Then change lines 10 and 20 of your program to:

```
10 CLEAR 200,&H7DD0-&HE00
20 LOADM"GSPRE"
```

For the rest of the instructions use

Dan Downard is an electrical engineer and has been involved in electronics for 27 years through Ham radio (K4KWT). His interest in computers began about eight years ago and he has built several 68XX systems.

`SAVE`, `SAVEM` and `LOAD` instead of `CSAVE`, `CSAVEM` and `CLOAD`.

• *I have a Gorilla Banana printer which was purchased from DAK. Any time I try a graphics printout (like* CoCo Max*), it never works. I have set the baud rate, checked connections and power supplies. I really want to use Hong Kwong's program in the May 1986* RAINBOW. *Could you please tell me what to do?*

Jim Messer
Jacksonville, FL

Jim, we'll let William Tenison answer your question.

• *On May 13, I wrote you requesting information regarding screen dump information for my CoCo to my Gorilla Banana. I also asked if this printer would print graphics.*

I should have read my new RAINBOW *before I wrote. In it you told about Radio Shack's screen dump program* DWDUMP, *Catalog No. 26-3121.*

I have also solved my problem of getting the Gorilla to accept CoCo Max *graphics. For anyone else who might have this problem here is how I did it:*

On power-up, run the following program to put the printer in graphics mode:

```
20 PRINT #-2, CHR$(8)
30 FOR TIME = 1 to 20
40 C=C+1
50 PRINT C;
60 NEXT TIME
70 END
```

With the CoCo Max *disk in the drive, type* `RUN "CONFIG"`.

Configure CoCo Max *to the DMP-100 at 600 baud.*

Type `RUN "COCOMAX"`.

William J. Tenison, Jr.
Jackson, TN

• *While I was working on a program that used the 64-by-64 graphics mode, I did the following:* `POKE359,57:POKE65314,85`. *What I got is a seemingly normal screen but with a green border instead of the usual black and real lowercase! I tried to poke some other values in Address 65314 and I came up with some interesting results:*

`POKE65314,21` — *Real lowercase on normal screen*
`POKE65314,85` — *Real lowercase with green border*
`POKE65314,60` — *Real lowercase on inverse screen*
`POKE65314,0` — *Usual CoCo screen*
`POKE65314,45` — *Inverse screen*
`POKE65314,73` — *Green border*

These pokes do not function on CoCos older than Tandy's latest release. Before using any of the pokes, you must first type `POKE359,57`. *Do you know what is the cause of this? Also, do you know a way to get one of these pokes permanently on my CoCo (i.e., on power up)?*

Richard Bellavance
Rimouski, Quebec

Richard, the reason you are obtaining these results is that you have one of the new 6847T1 VDGs in your CoCo. The only way I know to have these pokes on power-up is to modify the ROMs. The VDG is initialized each time a restart is encountered.

• *I have a 26-3134B. It uses the new RAM configuration. What is involved in upgrading it to 64K and Extended* BASIC?

I noticed jumpers labeled 256K on the PC board. Is there a new 256K upgrade coming? Any information?

Bob Ritterbeck
Akron, OH

Bob, the jumpers you are referring to are actually for the ROM in your CoCo. Don't you wish they were for the RAM?

• *I am interested in putting* BASIC *and compiled machine language programs into ROM packs. Could you give me any suggestions on how to go about doing this? Will these programs auto-execute when the computer is turned on, and when the reset button is pressed like Radio Shack ROM Packs? What is the reason for this? Where can I purchase blank ROM packs?*

Darren Dykstra
Sand Lake, MI

Darren, a program is included with the newer version of the Intronics EPROM Programmer that will do exactly what you want. Unfortunately I don't know if they sell it separately. You may write and ask.

• *Is there a peek or poke, or some other simple way to "test" an item to find out what minimum RAM the program will run in?*

Jeffrey Linder
Lake Carmel, NY

You might try using the `CLEAR` command to limit the area of memory that BASIC uses. Entering `CLEAR 200,16383` will cause BASIC to assume that there is only 16K of available RAM; if you have a CoCo with standard color BASIC (not Extended) you could go a step further and use `CLEAR 200,4095` to tell BASIC to use only 4K if you wanted to check a program that is intended to run on 4K machines. After using the `CLEAR` statement, load your program and check to see that it runs properly. (A few programs written for 32K machines, such as those that poke their own machine language routines into high memory, will ignore the `CLEAR` statement; if this happens, the program will run properly even though it really requires 32K and won't run on an actual 16K CoCo.)

Your technical questions are welcomed. Please address them to: Downloads, THE RAINBOW, P.O. Box 385, Prospect, KY 40059. We reserve the right to publish only questions of general interest and to edit for space and clarity. Due to the large volume of mail we receive, we are unable to answer letters individually.

Your technical questions may also be sent to us through the MAIL section of our new Delphi CoCo SIG. From the CoCo SIG> prompt, pick Rainbow Magazine Services, Then, at the RAINBOW> prompt, type `LET` to arrive at the LETTERS> prompt, where you can select the "Downloads" online form which has complete instructions.

RAINBOW Info

How To Read Rainbow

Please note that all the BASIC program listings in THE RAINBOW are formatted for a 32-character screen — so they show up just as they do on your CoCo screen. One easy way to check on the accuracy of your typing is to compare what character "goes under" what. If the characters match — and your line endings come out the same — you have a pretty good way of knowing that your typing is accurate.

We also have "key boxes" to show you the *minimum* system a program needs. But, *do* read the text before you start typing.

Finally, the little cassette symbol on the table of contents and at the beginning of articles indicates that the program is available through our RAINBOW ON TAPE service. An order form for this service is on the insert card bound in the magazine.

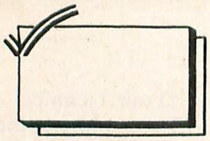
What's A CoCo?

CoCo is an affectionate name that was first given to the Tandy Color Computer by its many fans, users and owners.

However, when we use the term CoCo, we refer to both the Tandy Color Computer and the TDP System-100 Computer. It is easier than using both of the "given" names throughout THE RAINBOW.

In most cases, when a specific computer is mentioned, the application is for that specific computer. However, since the TDP System-100 and Tandy Color are, for all purposes, the same computer in a different case, these terms are almost always interchangeable.

The Rainbow Check Plus



The small box accompanying a program listing in THE RAINBOW is a "check sum" system, which is designed to help you type in programs accurately.

Rainbow Check PLUS counts the number and values of characters you type in. You can then compare the number you get to those printed in THE RAINBOW. On longer programs, some benchmark lines are given. When you reach the end of one of those lines with your typing, simply check to see if the numbers match.

To use *Rainbow Check PLUS,* type in the program and CSAVE it for later use, then type in the command RUN and press ENTER. Once the program has run, type NEW and press ENTER to remove it from the area where the program you're typing in will go.

Now, while keying in a listing from THE RAINBOW, whenever you press the down-arrow key, your CoCo gives the check sum based on the length and content of the program in memory. This is to check against the numbers printed in THE RAINBOW. If your number is different, check the listing carefully to be sure you typed in the correct BASIC program code. For more details on this helpful utility, refer to H. Allen Curtis' article on Page 21 of the February 1984 RAINBOW.

Since *Rainbow Check PLUS* counts spaces and punctuation, be sure to type in the listing exactly the way it's given in the magazine.

```
10 CLS:X=256*PEEK(35)+178
20 CLEAR 25,X-1
30 X=256*PEEK (35)+178
40 FOR Z=X TO X+77
50 READ Y:W=W+Y:PRINT Z,Y;W
60 POKE Z,Y:NEXT
70 IFW=7985THEN80ELSEPRINT
   "DATA ERROR":STOP
80 EXEC X:END
90 DATA 182, 1, 106, 167, 140, 60, 134
100 DATA 126, 183, 1, 106, 190, 1, 107
110 DATA 175, 140, 50, 48, 140, 4, 191
120 DATA 1, 107, 57, 129, 10, 38, 38
130 DATA 52, 22, 79, 158, 25, 230, 129
140 DATA 39, 12, 171, 128, 171, 128
150 DATA 230, 132, 38, 250, 48, 1, 32
160 DATA 240, 183, 2, 222, 48, 140, 14
170 DATA 159, 166, 166, 132, 28, 254
180 DATA 189, 173, 198, 53, 22, 126, 0
190 DATA 0, 135, 255, 134, 40, 55
200 DATA 51, 52, 41, 0
```

Using Machine Language

Machine language programs are one of the features of THE RAINBOW. There are a number of ways to "get" these programs into memory so you can operate them.

The easiest way is by using an editor/assembler, a program you can purchase from a number of sources.

An editor/assembler allows you to enter mnemonics into the CoCo and then have the editor/assembler assemble them into specific instructions that are understood by the 6809 chip, which controls your computer.

When using an editor/assembler, all you have to do, essentially, is copy the relevant instructions from THE RAINBOW's listing into CoCo.

Another method of getting an assembly language listing into CoCo is called "hand assembly." As the name implies, you do the assembly by hand. This can *sometimes* cause problems when you have to set up an ORIGIN statement or an EQUATE. In short, you have to know something about assembly to hand-assemble some programs.

Use the following program if you wish to hand-assemble machine language listings:

```
10 CLEAR200,&H3F00:I=&H3F80
20 PRINT "ADDRESS:";HEX$(I);
30 INPUT "BYTE";B$
40 POKE I,VAL("&H"+B$)
50 I=I+1:GOTO 20
```

This program assumes you have a 16K CoCo. If you have 32K, change the &H3F00 in Line 10 to &H7F00 and change the value of I to &H7F80.

The Rainbow Seal

RAINBOW
CERTIFICATION
SEAL

The Rainbow Certification Seal is our way of helping you, the consumer. The purpose of the Seal is to certify to you that any product that carries the Seal has been physically seen by us, that it does, indeed, exist and that we have a sample copy here at THE RAINBOW.

Manufacturers of products — hardware, software and firmware — are encouraged by us to submit their products to THE RAINBOW for certification. We ascertain that their products are, in actuality, what they purport to be and, upon such determination, award a Seal.

The Seal, however, is not a "guarantee of satisfaction." The certification process is different from the review process. You are encouraged to read our reviews to determine whether the product is right for your needs.

There is absolutely no relationship between advertising in THE RAINBOW and the certification process. Certification is open and available to any product pertaining to CoCo. A Seal will be awarded to *any* commercial product, regardless of whether the firm advertises or not.

We will appreciate knowing of instances of violation of Seal use.

BARDEN'S BUFFER

More on PSET, PRESET and Graphics Speed

By William Barden, Jr.
Rainbow Contributing Editor

What do weather radar pictures on local TV news programs and the Color Computer have in common? More than you might think. In the last column I was nonplussed because I had coded an assembly language subroutine for setting and resetting points on a 256-by-192 graphics screen, only to find it was slower than the Microsoft BASIC `PSET` and `PRESET`! In this column I will be vindicated, to a certain extent, when I show you a Line subroutine. The whole purpose of this exercise, by the way, is to show you what's involved in CoCo graphics. The assembly language for graphics is not that easy, but once you have a few base subroutines, such as a Set Point and Draw Line, you can build upward. And we'll answer that question about TV weather radar.

PSET Revisited

In case you missed last month's column, the assembly language `PSET` code is shown in Listing 1. Input to `PSET` is an X,Y point for a high resolution screen, stored in `YX` in reverse order. As there are 32 bytes per row in this resolution, each byte specifying eight pixels, dividing `YX` by 8 gives the displacement to the row. Adding $E00 (for a disk system) points to the actual byte for the point. A point at X,Y = 100,50, for example, has a Y,X value of 50 * 256 + 100 or 12,900. Dividing 12,900 by 8 gives 1,612 for the displacement from the start of the graphics page (any remainder from the division is thrown away). A decimal value of 1612 is Hex $64C. Adding $E00 to $64C gives $144C, the actual byte location containing the bit for the pixel 100,50.

The byte location actually contains on/off status for eight pixels. To locate the proper bit, the least significant three bits of X are examined and used to index into a mask table of eight values. These three bits represent values of 0 through 7; the mask table entries of 0 through 7 contain the proper bit setting, such that the mask table value can be ORed with the pixel byte to set the proper pixel. Using the point at X,Y = 100,50 as an example, the X value in binary is 00110010. ANDing this X value with 00000111 (7) results in:

```
        00110010     X = 50
AND     00000111     To mask out three lower bits
        ________
        00000010     Result = 0000010 = 2
```

When this index value is added to the address of MSKTAB, the mask value at MSKTAB + 2 is read. This value, $20, is used to set Bit 5 of the byte location, regardless of the state of Bit 5 previously (set or reset).

```
        XXXXXXXX     Contents of byte location
OR      00100000     MSKTAB value, to set bit
        ________
        XX1XXXXX     Bit 5 set; others unchanged
```

The same process can be done for `PRESET`, except that an AND of an inverted mask retains all bits except for the one to be reset.

```
        XXXXXXXX     Contents of byte location
AND     11011111     PRESET MSKTAB value, to set bit
        ________
        XX0XXXXX     Bit 5 reset; others unchanged
```

Although this code is efficient and fast, I found to my chagrin that it is not as fast as the Microsoft BASIC `PSET`. Although my `PSET` code *is* more efficient, the calling sequence to pass the X,Y parameters to the assembly language subroutine from BASIC is time-consuming.

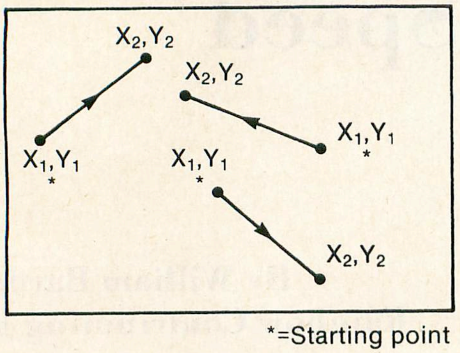
Bill Barden has written 27 books and over 100 magazine articles on various computer topics. His 20 years experience in the industry covers a wide background: programming, systems analyzing and managing projects ranging from mainframes to microcomputers.

A Line Subroutine

An assembly language subroutine to draw a line on the screen can utilize the `PSET` and `PRESET` subroutines. But how do we go about drawing a line on the screen? Let's consider some methods that could be used.

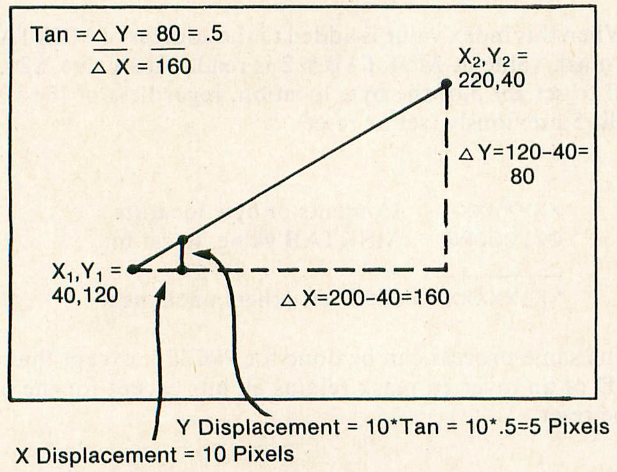
If we keep the same way of specifying lines as BASIC, we'll have a starting point called X1,Y1 and an ending point called X2,Y2, as shown in Figure 1. (We don't have to use this convention. We could specify a starting point, an angle and a line length, for example. We'll stick to the start and end point standard here, however.)

Figure 1: Line Start and End Points



We could use trigonometry in plotting the points. The tangent of an angle is the ratio of the opposite side's length over the length of the adjacent side. Advancing one X pixel at a time, we could multiply the tan value by the new X displacement to find the corresponding Y displacement, as shown in Figure 2. But that's awfully messy, for a very good reason. It uses division to get the tan value in the first place and multiplication to get every consecutive point.

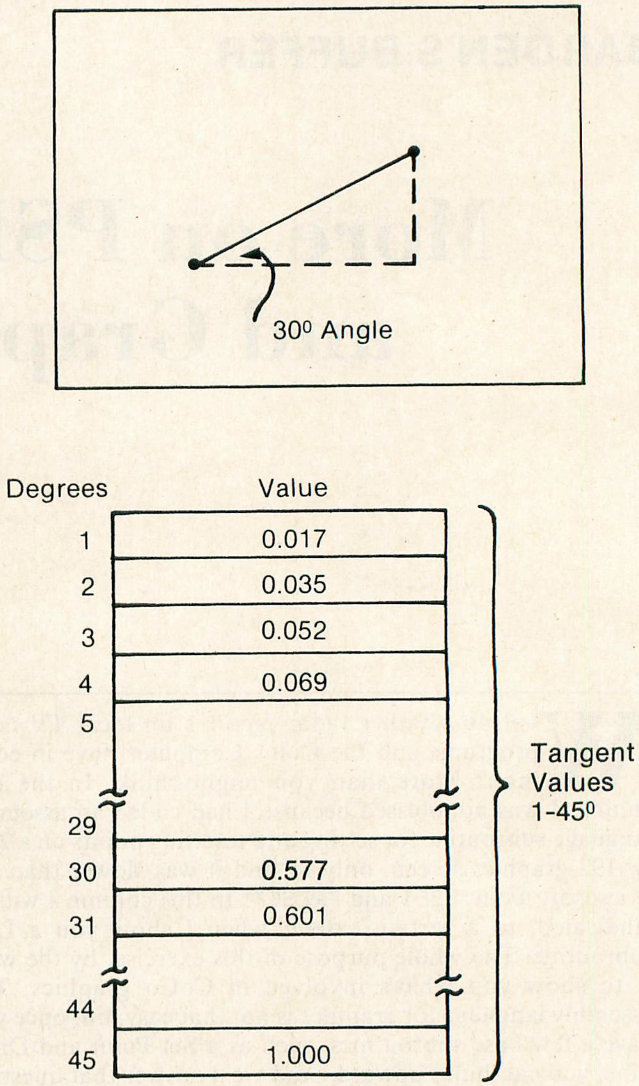
Figure 2: Plotting Points by Trigonometry



Another approach that could be used is to compute the tan value and use it as an index into a table of increment values, as shown in Figure 3. The table would give the amount that the Y value would be incremented for every step in the X direction.

Take an angle of 30 degrees, for example. Every step of one pixel in X causes a step of .577 in the Y direction. Keeping a running total of the accumulated Y value would define the Y pixel to be set. Again, though, this calls for fractional arithmetic which is achieved by floating-point operations, or, at the very least, "scaling."

Figure 3: Increment Values Stored In a Table



Degrees	Value
1	0.017
2	0.035
3	0.052
4	0.069
5	
29	
30	0.577
31	0.601
44	
45	1.000

We're on the right track, however. The ratio of Y to X can be used not to access a table of values, but directly. This is the scheme that Microsoft uses in its implementation of `LINE`. It's shown in the BASIC program of Listing 2. The algorithm is a variation of one called Bresenham's Line Algorithm, which you can find in books on computer graphics, such as *Computer Graphics* by Schaum's Outline Series. (One that I can heartily recommend — it's probably clearer than most.)

The BASIC code is an emulation of the assembly language code for `LINE` in Extended Color BASIC at $9401 through $9502.

Microsoft's LINE Algorithm

The BASIC code is entered with X1, Y1 defining the starting point, and X2, Y2 defining the ending point. Variables X and Y are set equal to X1 and Y1, the starting point. X and Y hold the coordinate of the current screen point.

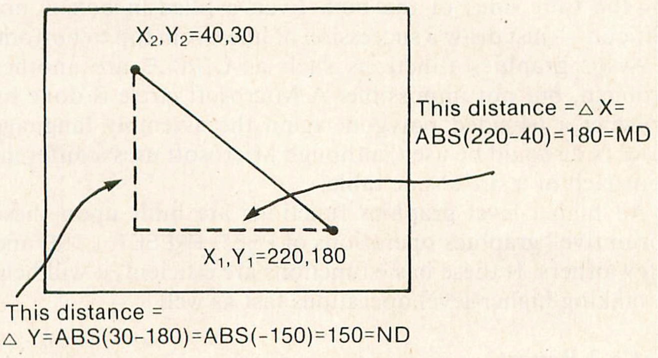
First, a check is made of X2 and X1. If X2 is greater than or equal to X1, then the increment from X1 to X2 will be positive; otherwise, it is negative. Variable `MA` (MAJORACT) is set to 1 or 3, respectively, to record this relationship.

Next, the same check is made of Y2 and Y1, with variable

NA (MINORACT) being set to 2 if Y2 is greater than or equal to Y1 or to 4 otherwise.

Next, variables MD (MAJORDELT) and ND (MINORDELT) are set to the absolute value of the actual distance in pixels from start to end, as shown in Figure 4.

Figure 4: Computing MD and ND



If MD (MAJORDELT) is greater than or equal to ND (MINORDELT), one point at a time along the X axis will be incremented. If ND (MINORDELT) is greater, one point at a time along the Y axis will be incremented. In the latter case, NA (MINORACT) is swapped with MA (MAJORACT) and MD (MAJORDELT) is swapped with ND (MINORDELT) so that the "major" action and deltas represent the governing increment, up/down or left/right. The "minor" action involves a fraction of a pixel increment.

Next MC (MAJORCNT) is set to MD (MAJORDELT). MC (MAJORCNT) holds the longest increment/decrement path. One PSET will occur for every pixel in this path.

NC (MINORCNT) is next set to half of MD (MAJORDELT). NC (MINORCNT) is incremented by ND (MINORDELT) for each PSET. This is a form of scaling where the minor increment represents a fractional increment. When the increment is greater than MD (MAJORDELT), then the current minor coordinate will be incremented or decremented by one. For a nearly flat horizontal line, many increments will be made of NC (MINORCNT) before Y changes. For lines closer to 45 degrees, Y will be changed almost as often as X. For vertical lines, the same action is taken, but on X instead of Y. The minor increment action is really a way to step along the shorter side.

The main loop starts at Line 1000. If the MC (MAJORCNT) represents X, one increment or decrement in the X direction is done for each count in MC (MAJORCNT). For each step, PSET writes the current point. The Y NC (MINORCNT) is then adjusted by adding ND (MINORDELT). If ND (MINORDELT) is greater than MD (MAJORDELT), Y is incremented or decremented in preparation for the next PSET. If the MC (MAJORCNT) represents Y, the same actions are taken but for Y and X. The four short subroutines at the end of the code represent the increment/decrement actions to be taken for incrementing or decrementing X and Y.

Confused? Admittedly, the algorithm is a little confusing. However, if you step through the BASIC code, it's fairly easy to see what is happening. The algorithm is efficient because each point along the line is written only once. In addition, there is no complicated math — just simple additions, comparisons and subtractions.

A typical call to the subroutine is shown in Listing 2 before the code for LINE.

The Weather Radar Puzzle Explained

The idea of writing each point only once is significant. Ten years ago, I worked at a company that developed color digitizers for weather radars. The idea was to take a *News At 5* black-and-white weather radar display and convert it to color. The engineer in charge had spent a great deal of time developing a hardware algorithm to simulate a radar sweep line. (To show how design efforts can be thwarted: The sweep line was "designed out" with a great deal of effort and expense in the converter electronics. However, television stations reported that viewers didn't believe the sweepless picture was really a legitimate radar scan, without the sweep line! The decision was made to put the sweep line back in.)

The engineer's algorithm was based upon incrementing X and Y an amount such that every pixel along the line of the sweep would be filled, but there would be no "gaps." He was also anxious to avoid many overwrites of pixels more than once. Unfortunately, he didn't use the Microsoft algorithm, and the resulting display, although fast enough, was inefficient, with many overwrites. But you know these hardware guys — at nanoseconds instead of milliseconds, they can afford to be sloppy.

In any event, the algorithm *is* one of the best in efficiency. All that's left is to speed it up by our own assembly language code.

Assembly Language Code for LINE

The assembly language code that performs the same algorithm as the BASIC program is shown in Listing 3. It follows the same steps as the BASIC code in about the same order. It is similar, but not identical, to the Microsoft code in ROM that draws lines.

In the main loop of the code, the X and Y registers have been set up to contain the proper subroutine address for

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incrementing or decrementing X and Y. These subroutines *are* `LIN101`, `LIN102`, `LIN103` and `LIN104`. The D register (A and B combined) contains the minor count, adjusted by adding the minor delta each time through the loop. The major count in `MC` is decremented at the end of the loop to control the number of `PSET`s.

An additional function has been added in this code, however. Variable `FUNC` controls either a `PSET` or `PRESET` — a 0 is `PRESET` while a 1 is a `PSET`. The code for `PSET` and `PRESET` follow the `LINE` subroutine. It is the same as that presented in the last column, with the exception of saving and restoring the CPU registers with a stack. Separate subroutines for `PSET` and `PRESET` speed up the overall execution for setting or resetting points, as no test for the function needs to be made.

Testing the Code

After all this work, it might be nice to have a Line subroutine that actually runs faster than the `LINE` function in Microsoft BASIC. The code here *is* faster. If used with other graphics assembly language code, it will be several times faster than calling `LINE` in BASIC. Even when called from BASIC, though, it is about twice as fast as `LINE`.

Listing 4 shows a BASIC program that illustrates the speed differences between `LINE` in BASIC and the code. In memory of that hardware engineer, this BASIC code simulates a radar scan in high-resolution graphics. A sweep line scans clockwise around the screen. The BASIC code to do this draws a line from the screen center to the screen edge and then erases it. There are four parts to the code, for each side of the screen.

The point at the screen center is constant, regardless of the direction of the line. We've chosen 128, 96 as the screen center.

The rightmost side is written by drawing a line from the center to a point at X=255 and a varying Y, from 0 (top-right corner) to 191 (bottom-right corner). Immediately after the line is drawn, it is erased by a `PRESET`. The other three sides use the same scheme — one coordinate for the side is held constant while the second varies. The sweeps of the four sides repeat continuously. One complete sweep around the screen takes about 82 seconds.

Listing 5 shows BASIC code that calls the assembly language `LINE` code. First, the assembly language object module is loaded from disk after memory from &H3F00 has been protected by a `CLEAR`. Next, the locations of `X1`, `Y1`, `X2`, `Y2` and `FUNC` in the assembly language `LINE` subroutine are defined. This just makes it a little less work to pass parameters, using short names instead of hexadecimal addresses.

There are five parameters to be passed: the starting X and Y (`X1`, `Y1`), the ending X, Y (`X2`, `Y2`) and the functions (0 for reset and 1 for set by `FUNC`). These parameters are located in the middle of the assembly language Line subroutine — no great disadvantage once `X1`, `Y1`, `X2`, `Y2` and `FUNC` have been defined.

The subroutine is called with the usual calling sequence. A `DEF USR0` defines the starting address of &HF000, and a call is made by `A=SR0(0)` with a dummy argument.

All five parameters need not be defined for each call of the subroutine. The five parameters are not changed by the subroutine so they do not need to be reinitialized if they have not been changed by the BASIC code.

There's a little more work involved here in setting up the parameters, but even with the overhead, a complete sweep takes only 54 seconds.

Using the Assembly Language LINE

You can use `PSET`, `PRESET` and `LINE` to do your own assembly language graphics and get a significant speed increase. You are sacrificing generality, however, as the assembly language code is designed for only high resolution two-color graphics. It's easy to see how a box function could be added to the code — four separate calls could be made for the four sides of the box. Even a filled-in box is not difficult — just draw a succession of lines from top to bottom.

BASIC graphics functions such as `CIRCLE` are another problem, but not impossible. A Microsoft circle is done by drawing a 64-sided polygon; again the assembly language `LINE` code could be used, although Microsoft uses a different approach of a sin/cosine table.

All higher-level graphics functions are built upon these "primitive" graphics operations of `PSET`, `PRESET`, `LINE` and a few others. If these basic functions are efficient, it will help in making higher-level operations fast as well.

CoCo 3 Report

After many phone calls checking on the availability of CoCo 3s, I was getting a little anxious. One evening I walked into my local Radio Shack, however, and glanced toward the CoCo display. This CoCo had more keys! Sure enough, it turned out to be a 3, the only one in the store and that day's new arrival. I immediately bought it. But I was worried. Would the CoCo 3 go? Would CoCo 2 users lust after it, as I had?

I found the answer at the RAINBOWfest in Princeton, N.J., on October 17-19. I was there giving a seminar on computer languages. While there, I was astounded at the number of Color Computer 3s that were being sold — every person walking out the door seemed to have a CoCo 3 box under his arm. Admittedly, the 3s were discounted, but it was apparent to me and everyone else that the CoCo 3 is going to be a hacker's dream and another Color Computer success.

Although I haven't spent a great deal of time on the CoCo 3, I can report that the disk *EDTASM* runs just fine, except for the minor inconvenience of having to restart after coming back to BASIC from the assembler.

I love my 3 and I hope you do, too. There's a lot of material that can be covered in this column about assembly language on the CoCo 3. The old high resolution mode of 256 by 192 in two colors pales by comparison to the 640-by-192 four-color modes. The additional memory of up to 512K leaves plenty of room for high-speed graphics and other applications. And even assembly language can benefit by the higher clock speed.

In future columns we'll be looking at these applications on the CoCo 3 and also looking in detail at assembly language under OS-9. The OS-9 assembler is a different animal from *EDTASM*, but the basic instruction set is the same — it's just the way OS-9 approaches things that makes it slightly more difficult. Please let me know your feelings about what topics you'd like to see covered in the column and the mix of CoCo 3/OS-9 and CoCo 2 topics. Till I hear from you, keep assembling! ☐

Listing 1:

```
        ORG     $3F00
PSET    LDD     YX          get Y to A, X to B
        LSRA                divide by 8 to get row displacement
        RORB
        LSRA
        RORB
        LSRA
        RORB
        ADDD   #$E00   point to actual byte
        TFR    D,Y     save in Y
        LDB    YX+1    X value to B
        ANDB   #7      get 0 - 7 value for bit position
        LDX    #MSKTAB address of mask table
        LDA    ,Y      get byte
        ORA    B,X     set bit
        STA    ,Y      restore byte
        RTS            return
MSKTAB  FCB    $80
        FCB    $40
        FCB    $20
        FCB    $10
        FCB    $08
        FCB    $04
        FCB    $02
        FCB    $01
YX      RMB    2       Y, X in reverse order
        END
```

Listing 2: LINEBAS

```
100 'BASIC DRAW LINE SUBROUTINE
110 SCREEN 1,0
120 PMODE 4,1
130 PCLS
140 X1 = 0: Y1 = 100: X2 = 255:
Y2 = 95
150 GOSUB 170
160 GOTO 160
170 'DRAW A LINE SUBROUTINE FROM
 X1,Y1 TO X2,Y2
180 X = X1: Y = Y1
190 IF X2 - X1 >= 0 THEN MA = 1
ELSE MA = 3
200 IF Y2 - Y1 >= 0 THEN NA = 2
ELSE NA = 4
210 MD = ABS( X2 - X1 )
220 ND = ABS( Y2 - Y1 )
230 IF MD < ND THEN T = MA: MA =
 NA: NA = T: T = MD: MD = ND: ND
 = T
240 MC = MD
250 NC = MD/2
260 IF ( MD AND 1 ) = 1 AND (MA
>= 3 ) THEN NC = NC - 1
270 'DRAW A LINE CORE CODE
280 FOR I = MC TO 0 STEP -1
290 PSET (X,Y)
300 ON MA GOSUB 360, 390, 420, 4
50
310 NC = NC + ND
320 IF NC - MD > 0 THEN NC = NC
- MD: BUMP = 1 ELSE BUMP = 0
330 IF BUMP = 1 THEN ON NA GOSUB
 360, 390, 420, 450
340 NEXT I
350 RETURN
360 'INCREMENT X
370 X = X + 1
380 RETURN
390 'INCREMENT Y
400 Y = Y + 1
410 RETURN
420 'DECREMENT X
430 X = X - 1
440 RETURN
450 'DECREMENT Y
460 Y = Y - 1
470 RETURN
```

Listing 3: LINEBIN

```
                  00100 ***************************************************
                  00110 * LINE SUBROUTINE. DUPLICATES MS BASIC 'LINE'*
                  00120 * INPUT : (X1,Y1)=STARTING POINT IN 256X192   *
                  00130 *         (X2,Y2)=ENDING POINT IN 256X192     *
                  00140 *         (FUNC)=0 IF PRESET, 1 IF PSET       *
                  00150 * OUTPUT: LINE DRAWN ON SCREEN                *
                  00160 ***************************************************
                  00170
3F00              00180         ORG   $3F00
3F00 FC   3F8C    00190 LINE    LDD   Y1      INITIALIZE X,Y BEGINNING
3F03 FD   3F91    00200         STD   YY      X1 --> X; Y1 --> Y
3F06 8E   3F7C    00210         LDX   #LIN101 IF DELTA X > DELTA Y
3F09 B6   3F8E    00220         LDA   X2      GET END POINT FOR X
3F0C B0   3F8D    00230         SUBA  X1      X2 - X1 = DELTA X
3F0F 24   04      00240         BHS   LIN010  GO IF DELTA X POSITIVE
3F11 40           00250         NEGA          TAKE ABSOLUTE VALUE
3F12 8E   3F84    00260         LDX   #LIN103 X DECREMENTS DOWN
3F15 B7   3F94    00270 LIN010  STA   MD+1    DELTA X=0 TO 255
3F18 7F   3F93    00280         CLR   MD      MAKE DOUBLE BYTE
3F1B 108E 3F80    00290         LDY   #LIN102 IF DELTA Y > DELTA X
3F1F B6   3F8F    00300         LDA   Y2      GET END POINT FOR Y
3F22 B0   3F8C    00310         SUBA  Y1      Y2-Y1 = DELTA Y
3F25 24   05      00320         BHS   LIN020  GO IF DELTA Y NEGATIVE
3F27 40           00330         NEGA          TAKE ABSOLUTE VALUE
3F28 108E 3F88    00340         LDY   #LIN104 Y DECREMENTS DOWN
3F2C B7   3F96    00350 LIN020  STA   ND+1    DELTA Y=0 TO 191
3F2F 7F   3F95    00360         CLR   ND      MAKE DOUBLE BYTE
3F32 FC   3F93    00370         LDD   MD      GET DELTA X
3F35 10B3 3F95    00380         CMPD  ND      LARGER THAN DELTA Y?
3F39 24   0B      00390         BHS   LIN025  GO IF YES
3F3B 1E   12      00400         EXG   X,Y     SWAP ACTION FUNCTIONS
```

```
3F3D FE    3F95       00410        LDU     ND       SWAP DELTAS-MAJOR
3F40 FD    3F95       00420        STD     ND       INCREMENT IS LARGEST
3F43 FF    3F93       00430        STU     MD       DELTA
3F46 FC    3F93       00440 LIN025 LDD     MD       GET MAJOR DELTA
3F49 F7    3F97       00450        STB     MC       STORE IN MAJOR COUNT
3F4C 54               00460        LSRB             MAJOR DELTA/2
3F4D B6    3F94       00470        LDA     MD+1     GET MAJOR DELTA
3F50 84    01         00480        ANDA    #1       TEST FOR ODD# POINTS
3F52 27    06         00490        BEQ     LIN028   GO IF EVEN
3F54 8C    3F84       00500        CMPX    #LIN103  ODD DECREMENT=SPECIAL
3F57 25    01         00510        BLO     LIN028   GO IF INCREMENT
3F59 5A               00520        DECB             ADJUST COUNT BY ONE
3F5A 4F               00530 LIN028 CLRA             D=MINOR COUNT
                      00540 * MAIN LOOP HERE - EXECUTED MAJOR DELTA TIMES
3F5B 7D    3F90       00550 LIN030 TST     FUNC         TEST PRESET OR PSET
3F5E 26    04         00560        BNE     LIN035       GO IF PSET
3F60 8D    5F         00570        BSR     PRESET       PRESET CALL
3F62 20    02         00580        BRA     LIN036       CONTINUE
3F64 8D    32         00590 LIN035 BSR     PSET         PSET CALL
3F66 AD    84         00600 LIN036 JSR     ,X           BUMP MAJOR POINT
3F68 F3    3F95       00610        ADDD    ND           ADD MINOR DELTA TO COUNT
3F6B 10B3  3F93       00620        CMPD    MD           TIME TO BUMP MINOR?
3F6F 25    05         00630        BLO     LIN050       GO IF NO
3F71 B3    3F93       00640        SUBD    MD           GET NEW COUNT
3F74 AD    A4         00650        JSR     ,Y           BUMP (OR DECR) MINOR
3F76 7A    3F97       00660 LIN050 DEC     MC           DECREMENT MAJOR COUNT
3F79 26    E0         00670        BNE     LIN030       REPEAT IF NOT DONE
3F7B 39               00680        RTS              RETURN FROM LINE SUBR
                      00690
3F7C 7C    3F92       00700 LIN101 INC     XX       FOR X2 > X1 CASE
3F7F 39               00710        RTS
                      00720
3F80 7C    3F91       00730 LIN102 INC     YY       FOR Y2 > Y1 CASE
3F83 39               00740        RTS
                      00750
3F84 7A    3F92       00760 LIN103 DEC     XX       FOR X2 > X1 CASE
3F87 39               00770        RTS
                      00780
3F88 7A    3F91       00790 LIN104 DEC     YY       FOR Y2 < Y1 CASE
3F8B 39               00800        RTS
                      00810
                      00820 * WORKING STORAGE AREA
3F8C                  00830 Y1     RMB     1        STARTING POINT (INPUT)
3F8D                  00840 X1     RMB     1
3F8E                  00850 X2     RMB     1        ENDING POINT (INPUT)
3F8F                  00860 Y2     RMB     1
3F90                  00870 FUNC   RMB     1        0=PRESET, 1=PSET (INPUT)
3F91                  00880 YY     RMB     1        FOR PSET OR PRESET CALL
3F92                  00890 XX     RMB     1
3F93                  00900 MD     RMB     2        MAJOR DELTA, X OR Y
3F95                  00910 ND     RMB     2        MINOR DELTA, X OR Y
3F97                  00920 MC     RMB     1        MAJOR COUNT = # MAJOR PNTS
                      00930
                      00940 * PSET SUBROUTINE
3F98 34    36         00950 PSET   PSHS    D,X,Y    SAVE REGS
3F9A FC    3F91       00960        LDD     YY       Y TO A, X TO B
3F9D 44               00970        LSRA             /8 TO GET ROW DISP
3F9E 56               00980        RORB
3F9F 44               00990        LSRA
3FA0 56               01000        RORB
3FA1 44               01010        LSRA
3FA2 56               01020        RORB
3FA3 C3    0E00       01030        ADDD    #$E00    POINT TO ACTUAL BYTE
3FA6 1F    02         01040        TFR     D,Y      SAVE IN Y
3FA8 F6    3F92       01050        LDB     YY+1     X VALUE TO B
3FAB C4    07         01060        ANDB    #7       GET 0 - 7 VALUE FOR BIT POS
3FAD 8E    3FB9       01070        LDX     #MSKTAB  ADDRESS OF MASK TABLE
3FB0 A6    A4         01080        LDA     ,Y       GET BYTE
3FB2 AA    85         01090        ORA     B,X      SET BIT
3FB4 A7    A4         01100        STA     ,Y       RESTORE BYTE
3FB6 35    36         01110        PULS    D,X,Y    RESTORE REGS
3FB8 39               01120        RTS              RETURN
                      01130 * MASK TABLE FOR PSET
```

```
3FB9        80        01140 MSKTAB  FCB       $80
3FBA        40        01150         FCB       $40
3FBB        20        01160         FCB       $20
3FBC        10        01170         FCB       $10
3FBD        08        01180         FCB       $08
3FBE        04        01190         FCB       $04
3FBF        02        01200         FCB       $02
3FC0        01        01210         FCB       $01
                      01220 * PRESET SUBROUTINE
3FC1 34     36        01230 PRESET  PSHS      D,X,Y     SAVE REGS
3FC3 FC     3F91      01240         LDD       YY        Y TO A, X TO B
3FC6 44               01250         LSRA                /8 TO GET ROW DISP
3FC7 56               01260         RORB
3FC8 44               01270         LSRA
3FC9 56               01280         RORB
3FCA 44               01290         LSRA
3FCB 56               01300         RORB
3FCC C3     0E00      01310         ADDD      #$E00     POINT TO ACTUAL BYTE
3FCF 1F     02        01320         TFR       D,Y       SAVE IN Y
3FD1 F6     3F92      01330         LDB       YY+1      X VALUE TO B
3FD4 C4     07        01340         ANDB      #7        GET 0 - 7 VALUE FOR BIT POS
3FD6 8E     3FE2      01350         LDX       #MSKTA1   ADDRESS OF MASK TABLE
3FD9 A6     A4        01360         LDA       ,Y        GET BYTE
3FDB A4     85        01370         ANDA      B,X       SET BIT
3FDD A7     A4        01380         STA       ,Y        RESTORE BYTE
3FDF 35     36        01390         PULS      D,X,Y     RESTORE REGS
3FE1 39               01400         RTS                 RETURN
                      01410 * MASK TABLE FOR PRESET
3FE2        7F        01420 MSKTA1  FCB       $7F
3FE3        BF        01430         FCB       $BF
3FE4        DF        01440         FCB       $DF
3FE5        EF        01450         FCB       $EF
3FE6        F7        01460         FCB       $F7
3FE7        FB        01470         FCB       $FB
3FE8        FD        01480         FCB       $FD
3FE9        FE        01490         FCB       $FE
            0000      01500         END

00000 TOTAL ERRORS
```

Listing 4: RADARBAS

```
100 'RADAR SCAN PROGRAM IN BASIC
110 CLEAR 100,&H3EFF
120 LOADM "LINE"
130 SCREEN 1,0
140 PMODE 4
150 PCLS
160 FOR Y=0 TO 191: LINE (128,10
0)-(255,Y),PSET: LINE (128,100)-
(255,Y),PRESET: NEXT Y
170 FOR X=255 TO 0 STEP -1:LINE
(128,100)-(X,191),PSET: LINE (12
8,100)-(X,191),PRESET: NEXT X
180 FOR Y=191 TO 0 STEP -1: LINE
 (128,100)-(0,Y),PSET: LINE(128,
100)-(0,Y),PRESET: NEXT Y
190 FOR X=0 TO 255: LINE (128,10
0)-(X,0),PSET: LINE(128,100)-(X,
0),PRESET: NEXT X
200 GOTO 160
```

Listing 5: RADARBIN

```
100 ' RADAR SCAN PROGRAM USING A
SSEMBLY LANGUAGE PSET
110 CLEAR 100,&H3EFF
120 LOADM "LINE"
130 SCREEN 1,0
140 PMODE 4
150 PCLS
160 X1=&H3F8D: X2=&H3F8E: Y1=&H3
F8C: Y2=&H3F8F: FUNC=&H3F90
170 DEFUSR=&H3F00
180 POKE X1,128: POKE Y1, 100
190 POKE X2,255:FOR Y=0 TO 191:P
OKE FUNC,1:POKE Y2,Y:A=USR0(0):P
OKE FUNC,0:A=USR0(0):NEXT Y
200 POKE Y2,191:FOR X=255 TO 0 S
TEP -1:POKE FUNC,1:POKE X2,X:A=U
SR0(0):POKE FUNC,0:A=USR0(0):NEX
T X
210 POKE X2,0:FOR Y=191 TO 0 STE
P -1:POKE FUNC,1:POKE Y2,Y:A=USR
0(0):POKE FUNC,0:A=USR0(0):NEXT
Y
220 POKE Y2,0:FOR X=0 TO 255:POK
E FUNC,1:POKE X2,X:A=USR0(0):POK
E FUNC,0:A=USR0(0):NEXT X
230 GOTO 190
```

BITS AND BYTES OF BASIC

The First Days With CoCo 3: Experimentation and Discovery

By Richard A. White
Rainbow Contributing Editor

The old gray box was quiet as its plugs and multipack interface were pulled. Certainly, this had happened many times before in preparation for trips to users group meetings or the vacation cottage in Michigan. If it suspected that its successor had arrived, it did not let on.

And it had plenty of reason to doubt. In its nearly six years of existence, it had seen reams of words about other computers pour through its keyboard. The actual presence of a Model 100 had failed to change the old gray box's preeminent position. The Tandy 1000 was talked about, but never appeared on site, and dreaming about a "new CoCo" had been going on for over two years.

But, recently, a message appeared. You've seen them, the "while you were out" type, short and to the point:

Date: 10/10 Hour: 3:45
Name: Don Eaker
Telephoned: have good news

Richard White lives in Fairfield, Ohio, has a long background with microcomputers and specializes in BASIC *programming. With Don Dollberg, he is the coauthor of the* TIMS *database management program.*

Don runs the Fairfield, Ohio, Tandy Computer Center and has a reputation for making things happen. His is the only Radio Shack facility in the southern Ohio area whose listing in the telephone book is in boldface type. Less than an hour later, CoCo 3, Serial Number 1001394, left its last Tandy home to go on active duty.

With the old gray box on the sidelines, it was simple enough to plug 1394 in its place and fire it up. It was feeding an amber monochrome monitor, since the analog RGB monitor had not yet showed up. Marty Goodman had already alerted us to the inadequacies of a monochrome monitor handling a color composite video signal, and the 32-character screen display was certainly less than good. No surprise here, so let's move on to the 40-character screen by typing `WIDTH 40`. The screen cleared to one color and what looked like the `OK` appeared in the upper left-hand corner.

The `O` was partly lost off the left edge of the screen. Adjusting the width knob on the back of the monitor brought the entire character onto the screen. There was still the black grid in the background that Marty had described a few issues ago.

Typing `WIDTH 80` produced the 80-character screen, which was also laced with background lines. Now came the discovery that makes computers so much fun. When I typed `CLS5`, the background cleared to a uniform shade and the characters were clearly readable.

With the legibility problem solved, it was time to move on to finding out what characters were available. Actually, all the characters and their codes are in the manual that comes with the machine. But there is a saying, "When all else fails read the manual." All else had not failed. A one-liner did the job and gave me a tool to probe speed in printing to the screen and observe screen scrolling:

```
10 FOR X=32 TO 255 :PRINT CHR$
(X); :NEXT :PRINT :GOTO10
```

This puts each printable character to the screen, then does a line feed and starts over again. The primary addition is a set of foreign and special characters that are not available from the keyboard. The old CoCo, colored block graphics are not available in the 40- and 80-character text screens.

The users group meeting the next day provided a chance for picky people to pass judgment on the characters and screen scrolling. A number were long-

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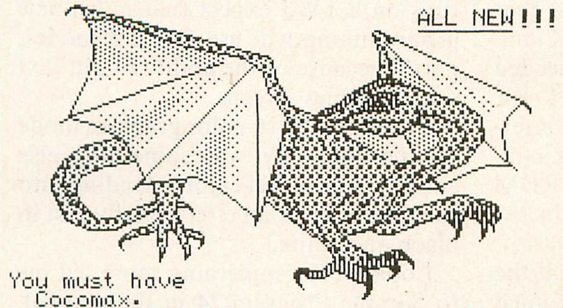

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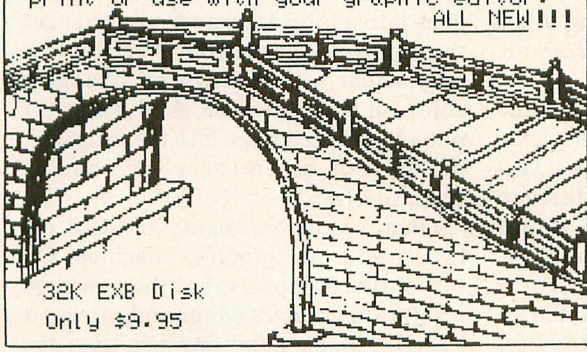

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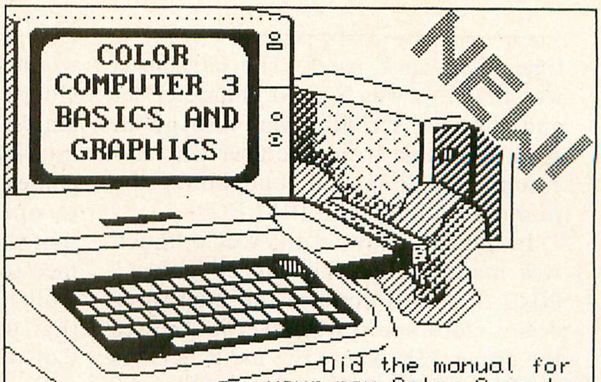
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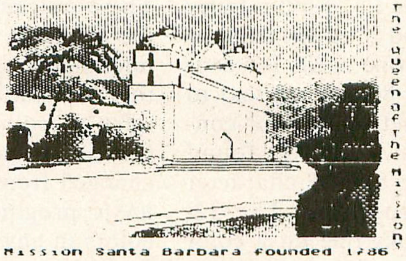

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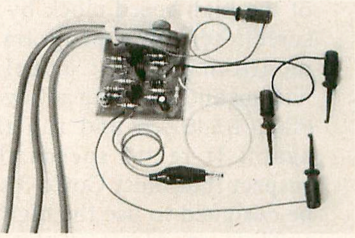

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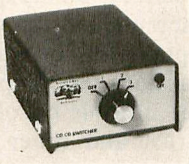

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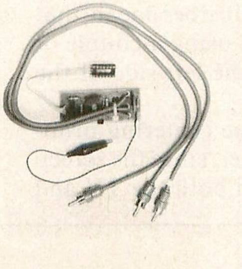

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time *Wordpack* users. The consensus was that this was a good character set and that the scrolling was also good. And this came from one user who has complained long and loud about the jumpy scrolling of an IBM PC.

In the early days of the CoCo, much was made of the "high-speed pokes." `POKE 65495,0` doubles the microprocessor clock speed whenever it accesses the upper 32K where the BASIC ROMs are located. `POKE 65497,0` doubles the clock speed without qualification. Only the earliest models have trouble with the `POKE 65495,0`. The old gray box will tolerate it only if there is no disk ROM pack installed.

Since CoCo 3 supports the 1.8-MHz clock, only the `POKE 65497,0` is used. Certain functions, including musical tone generation, the cassette port and serial port are clock-rate dependent and the `POKE 65496,0` is used to return the machine to the slower clock to achieve proper timing. Some people have been able to use the serial port at the higher clock rate. To date I have not heard of successful cassette operations at a high clock rate. You can easily see the effect of the high speed clock by running the screen scrolling program previously mentioned to get a feel for screen writing and scrolling at low speed. Then `POKE 65497,0` and run the program again. It really speeds things up. I suspect that most CoCo 3 software will be designed to use the high clock rate.

The next thing to do was to turn everything off and plug in the multipack interface that held the disk drive controller. I booted back up and issued a `DIR` command. I got back an SN Error. BASIC had not recognized the drive controller. Eventually, I dispensed with the interface and then could boot into Disk Extended BASIC Version 2.0 or 2.1. I have controllers with both versions 1.0 and 1.1 available. The CoCo 3 converts these to versions 2.0 and 2.1. However, when I tried to access the disk, an I/O Error resulted. Finally, it dawned on me that these were older controllers that require 12 volts, which is not supplied by either CoCo 2 or CoCo 3. Even worse, these controllers almost worked. They work well enough to trash any disk you try them on. So beware!

The solution to this problem is to use the older controllers in a multipack interface. But, if CoCo 3 does not see the Disk BASIC when it is in a multipack interface, we are back to square one. The problem is in the interface, and Radio Shack has said the PAL chip would need to be replaced. (See Marty Goodman's article on Page 98 of this issue.) However, we had assumed that interfaces would work with 128K machines and that the upgrade was needed to operate with 512K. We now know that the upgrade is needed for an interface to be operable at all. A disk controller with a Radio Shack DOS ROM that works in a CoCo 2 works in the CoCo 3.

One result of these doings is that the old gray box is back in its accustomed place performing its usual duties, while 1394 is on another table making pretty pictures. This arrangement works better for doing this column, since I can experiment on the CoCo 3 and then immediately move over to write about what I found.

At this point, I wanted to see some graphics. Rick Adams and Dale Lear had two programs on October's RAINBOW ON TAPE. The tape interface worked. The *Tunnel* program is not much on a black-and-white monitor, but *Wheel* does what it is intended to do. Since I had seen what I wanted to see on the monitor, it was time to hook 1394 to a color TV.

It quickly became apparent why Radio Shack has stayed with the 32-character CoCo screen so long. The 40- and 80-character text screens and the new high resolution graphics screens are 64 pixels wider than the old CoCo screens. If the TV does not properly center the screens, the edge of the left side is lost. In my case, one to two characters on the left edge of the 40-character screen and more on the 80-character screen were off the screen. The TV at the Computer Center was only somewhat better.

Interestingly, 80-character text is readable on my color TV, but it is fairly new and still has good contrast. And the quality is not what one needs for continuous use. Expect 80-column text to be illegible on old sets with poor contrast and other ills. I quickly found myself returning to the 32-character screen to enter programs. The 32-character screen looks fine on a color TV. It is only on monochrome monitors that one has trouble. This is not to say that programmers should not use the 40-character screen. It does mean that programs must forgo using a couple of columns at least on the left side of the screen.

The cause of the the centering problem lies in the computer, since the screen is offset to the left on both the TV and monitor. I am told that the same thing happens when an MS-DOS machine runs on a TV. I expect that much new programming will use CoCo 3 modes, partly because of the ability to put text onto graphics screens.

Tunnel in the 16-color graphics mode on the color TV was something else entirely. The pastel colors blending into each other gives an effect totally lost in black and white.

Looking for something more led me to Sample Program 24 in the manual. It draws 80 circles on the screen and fills each with a random color. It then draws some colored bars at the top and bottom of the screen. Then the program goes into a loop and randomly changes the colors in the palette. The result is spectacular with all elements changing colors at the same time. And it's fast. I put a high speed poke into the program, but took it out because the changes came too fast.

On a reasonable quality TV, CoCo 3 is a spectacular graphics machine. On top of this it appears that the new high resolution graphics commands are a bit easier to understand and use than the original Extended BASIC commands.

While the original Extended BASIC commands remain and should run all older Extended BASIC programs, their capability is enhanced so they can use any of the computer's 64-color set. These colors are now available to all text and graphics modes. The job is done through use of the palette, which is as good a place as any to start.

In the CoCo 3, as in previous CoCos, each color is referred to by number. Previous CoCos supported eight colors plus black in the low resolution graphics and two or four color subsets of these colors in the higher resolution modes. These restraints still apply, except that the available colors are determined by reference to specific slots in the palette that are initialized with numbers that refer to colors available on previous CoCos. These default settings can be changed from the keyboard or from a BASIC program changing the available colors in any text or graphics mode at any time.

`PALETTE` is used in two ways. The first is to configure the colors in the slots for either a composite monitor or TV set: `PALETTE CMP`. This is the default from a cold start. Whenever `PALETTE CMP` is issued, the default palette colors are reestablished. `PALETTE RGB` sets up the machine to use the RGB analog monitor to be released by Tandy. The

RGB monitor interpretation of colors is different from that of a composite video monitor. When you cold start a CoCo 3 with an RGB monitor, you will have to enter the `PALETTE RGB` command from the keyboard. The command could also be the first line of a BASIC program. I suspect that there will be a way to configure the computer for an RGB monitor from an OS-9 start-up file.

The second use is to change the color assigned to a particular slot or palette register. The syntax is `PALETTE pr, cc` where `pr` stands for palette register or slot and `cc` means color code.

There are 16 palette registers numbered 0 to 15. The computer refers to the palette registers to determine which colors are to appear on the screen. When a palette register's color assignments change, all locations on the screen referring to that slot change. Here is a BASIC program that will change the screen color showing all available colors:

```
10 HSCREEN 2
20 HCLS 2
30 FOR X=0 TO 63 : PALETTE 2,X
: FOR Y=1 TO 300 :NEXT Y,X
```

`HSCREEN 2` sets the computer for the 320-by-192, 16-color graphics. `HCLS2` clears the graphics screen to the color in Palette Register 2. In Line 30, `X` is incremented from 0 to 63 and the Color Codes are loaded into Palette Register 2 with `PALETTE 2,X`. `FOR Y=1 TO 300 :NEXT Y` is simply a delay loop so the colors can be observed.

The manual does not list all the available colors. This is probably because of differences in the ways different monitors and TVs display colors. What may be yellow on one machine could be yellow-orange on another, while a pastel green might be shifted to yellow. What they call buff looks like white to me. A program, Sample Program 23, is provided to present each color and its number in groups of eight. With this program, you can view all the colors and list them as they appear with your equipment. A picture of the first screen shown by this program should help you adjust your TV or monitor to display colors in a similar manner. There appear to be 16 basic colors with pastel variations. In the first cycle, the colors are intense with intensity diminishing in higher numbered cycles. The only colors I really missed were dark brown and a selection of grays. A picture of the old gray box might need to have a bluish cast. And it certainly will be possible to draw an electric pink Cadillac.

Slot	Color	CMP Code	RGB Code
0	Green	18	18
1	Yellow	36	54
2	Blue	11	9
3	Red	7	36
4	Buff	63	63
5	Cyan	31	27
6	Magenta	9	45
7	Orange	38	38
8	Black	0	0
9	Green	18	18
10	Black	0	0
11	Buff	63	63
12	Black	0	0
13	Green	18	18
14	Black	0	0
15	Orange	38	38

Table 1: Startup Color Assignments

	CLS	ATTR Foreground	ATTR Background
Color 0	----	Slot 8	Slot 0
Color 1	Slot 0	Slot 9	Slot 1
Color 2	Slot 1	Slot 10	Slot 2
Color 3	Slot 2	Slot 11	Slot 3
Color 4	Slot 3	Slot 12	Slot 4
Color 5	Slot 4	Slot 13	Slot 5
Color 6	Slot 5	Slot 14	Slot 6
Color 7	Slot 6	Slot 15	Slot 7
Color 8	Slot 7	----	----
Defaults —	Foreground:	Slot 8	Black
	Background:	Slot 0	Green

Table 2: Color Slot Numbers

The startup color assignments are listed in the manual and are reproduced in Table 1.

The colors in slots 0 through 8 include the colors used by the traditional CoCo low resolution text screen, but color number does not correspond to slot number. Black is in slot 8 and all colors are in slots numbered one slot lower than the color number. I am not satisfied that this confusion is needed.

Things get worse with the 40- and 80-column text screens. `CLS` works just like it does for the 32-column screen. A new command, `ATTR c1,c2,B,U` is available. How `ATTR` does what it does is not immediately obvious. Central to understanding is that `c1`, the foreground color, uses one set of palette slots while `c2`, the background color, uses an entirely different set of slots. Further, `c1` uses higher numbered slots, while `c2` uses lower numbered slots. It seems backward. Reread this paragraph and make sure you understand the arrangement. Perhaps a table will help. Table 2 appears on Page 300 in the manual.

The discussion of `ATTR` in the front of *the manual* does not even mention the table, leaving the user to wallow in confusion.

To finish off `ATTR`, `B` is a switch to start text blinking and then stop blinking; `U` is a switch to start and stop underlining.

At this point we have enough information to explain why `CLS5` clears the screen on a monochrome monitor and makes the lettering legible. Color 5 references Slot 4, whose default color is buff (which is white for most purposes). The default foreground color is black. The composite video signal carries only black and white information, which is what the black and white monitor wants to see. `ATTR 2,4` accomplishes the same thing. Available background colors do not include black in the default situation. Try this:

```
PALETTE 0,0
ATTR 1,0
```

This assigns the color black to Slot 0; green is in Slot 9, which is used as Foreground Color 1. The result is green letters on a black background. `ATTR 3,0` provides buff letters on black. Both displays have color fringes in a TV screen, but don't look bad from a distance. Neither color is readable on the 80-character screen, and dark on light is better on the 40-character screen. `PALETTE CMP` undoes all the damage we did with this experiment.

`PRINT`, `PRINT TAB` and `PRINT USING` work on the 40- and 80-column screen just as they do on the 32-column screen. `PRINT @n,` is only used on the 32-column screen. On the 40- and 80-column screens use `LOCATE x,y` to position the cursor to column x and row y. The next `PRINT` statement will begin printing at that location. The column can be 0 to 39 on the 40-column screen and 0 to 79 on the 80-column screen. On either screen, rows range from 0 to 23.

Note the difference between the ways `PRINT@n,` and `LOCATE x,y` work. `LOCATE x,y` merely positions the cursor at a particular column position on a specified line. When using `PRINT @n,` each screen location has a number. The range is 0 to 511 on the 32-character screen. Further, `PRINT @n,` expects there to be a string or variable following the comma, which is to be printed. You can use `PRINT @n,` like `LOCATE x,y`, if you follow the comma with a null string and a semicolon, like `PRINT @n,"";`.

As noted, the left one or two character positions on the 40-column screen are lost when using CoCo 3 on a color TV.

Good programming practice will be to start all printing at Column 3. This will generalize your programs so they will work on monitors or TVs. `LOCATE 2,y` would be used prior to each `PRINT` statement that is to print to the left side of the screen.

Alternately, you can use `PRINT TAB(4);"TEXT"`. This prints the text at the same position as `LOCATE 2,y`. The implication is that the computer uses 80-column locations even when working on a 40-column screen.

This essentially covers the operation of the 40- and 80-column text screens. They represent a major improvement over previous CoCos. Next month we will move on to the new graphics capabilities.

From the Princeton RAINBOWfest . . .

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THE RAINBOW recorded the main event of RAINBOWfest Princeton, the Saturday evening (Oct. 18) round-table discussion:

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KISSable OS-9

Debunking the Myth of OS-9 User Hostility

By Dale L. Puckett
Rainbow Contributing Editor

Since January's RAINBOW is dedicated to beginners, we'll take a fresh look at the basics of OS-9 this month and try to eliminate some of the apprehension that surrounds Color Computer owners trying to use OS-9 for the first time. We'll wrap up the column with a few tips submitted by readers.

Myth Versus Reality

OS-9 is the victim of a myth in Color Computer circles. Those who perpetuate that myth would have you believe that OS-9 is difficult to use and impossible to understand. Not so!

The ironic thing about this myth is the fact that it most likely exists because of the tremendous computing power built into OS-9. Many options come with this power; options that give you the opportunity to make many choices.

Many people become overwhelmed when they face too much freedom or too many choices. They think that just because a choice exists, they have to make it. They lose sight of the fact that no action — or choice — is always an option. A professional operating system like OS-9 usually delivers a popular default action when you decide not to make a choice.

To illustrate our point we will try to give several examples that compare OS-9 to the Disk Extended BASIC used by the Color Computer. To do this, we'll show you how to do a few trivial tasks using several different tools. For example, let's imagine we want to print a message on our Color Computer screen. With Disk Extended BASIC we could type a simple command to do the job immediately after we turn on our computer.

```
PRINT "HELLO, I'M A COLOR
COMPUTER!"
HELLO, I´M A COLOR COMPUTER
```

As soon as we type the command line, our Color Computer will print the second line on the screen. Disk Extended BASIC is a language and one of the verbs in that language is `PRINT`. Each time Disk Extended BASIC sees the word `PRINT` it looks at the string of characters or variable following that word and prints it.

If you wanted to print the same line on the screen several times, you could type in a short program and run it.

```
10 FOR X = 1 TO 10
20 PRINT "HELLO, I´M A COLOR
COMPUTER!"
30 NEXT X
RUN
HELLO, I´M A COLOR COMPUTER
HELLO, I´M A COLOR COMPUTER
```

BASIC09 is another computer language that runs under the OS-9 operating system. Using an advanced design, it compiles each line of your program into an intermediate or I-code as you type it in. As a result it can run your programs four to five times faster than Disk Extended BASIC. Additionally, programs written in BASIC09 are much easier to read and understand because they do not require line numbers and they let you use long variable names that convey a meaning. Reading a

---

Dale L. Puckett, who is author of The Official BASIC09 Tour Guide *and coauthor, with Peter Dibble, of* The Official Rainbow Guide to OS-9, *is a free-lance writer and programmer. He serves as director-at-large of the OS-9 Users Group and is a member of the Computer Press Association. Dale works as a U.S. Coast Guard chief warrant officer and lives on Governors Island in New York Harbor.*

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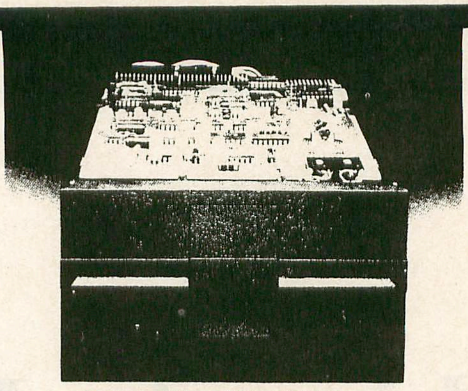

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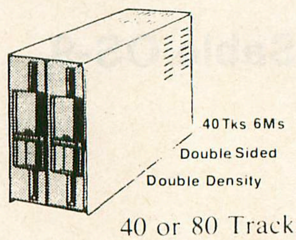

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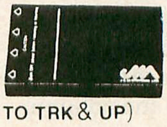

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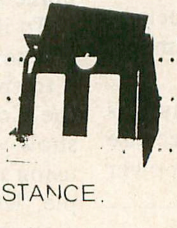

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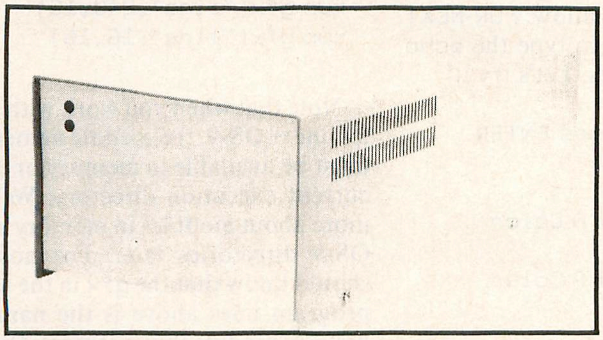

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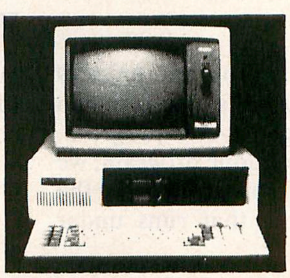

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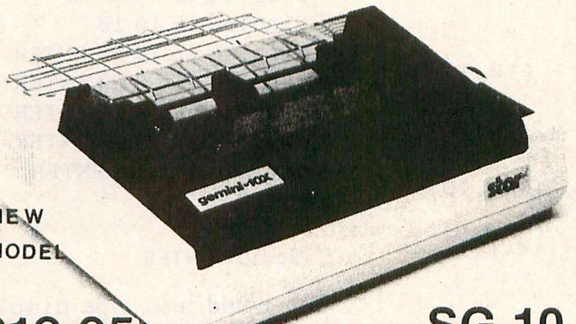

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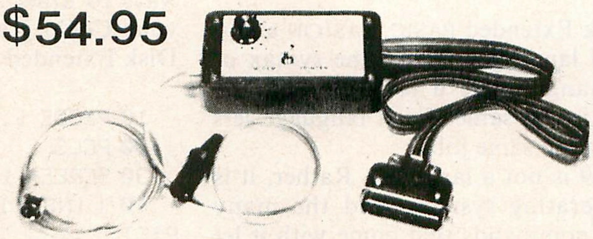

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BASIC09 program is almost like reading *the solution* to a problem written in English. For example:

```
FOR LINE := 1 TO 10
 PRINT "HELLO, I'M A COLOR
 COMPUTER!"
NEXT LINE
```

When we run this program, BASIC09 produces the same results on our screen as the Disk Extended BASIC program. If we wanted a stand-alone program, we could write the same program using the C language compiler that runs under OS-9.

```
main( )
{
 int line;
 for(line = 0; line != 10;
 line++)
 printf("HELLO, I'M A COLOR
 COMPUTER! \n");
}
```

> ***"Just think of an operating system as a traffic cop on a busy corner . . . OS-9 directs the flow of information inside your computer."***

Disk Extended BASIC, BASIC09 and C are all languages. While the syntax of each language is a bit different, the result is the same. Each language lets you do the same job.

OS-9 is not a language. Rather, it is an operating system. And the many utility commands that come with it let you do many things. For example, the OS-9 `echo` utility lets you simulate the first Disk Extended BASIC `PRINT` command line above. Even though it is a command that tells the OS-9 operating system to do something, it delivers a result just like the `PRINT` verb in Disk Extended BASIC. Try it. At the OS-9 prompt, type:

```
OS9: echo HELLO, I'M A COLOR
COMPUTER ENTER
HELLO, I'M A COLOR COMPUTER
```

Note that we did not type the exclamation point in our example. It is a special character in an OS-9 command line and is used to set up a pipeline. We'll talk about pipelines later.

By repeating the `echo` command line above 10 times in an OS-9 procedure file we could even simulate the other programs. However, since the OS-9 Shell is not a complete programming language and does not allow `FOR-NEXT` loops we would need to type the `echo` command line 10 times. Let's try it!

```
OS9: build TenTimes ENTER
? load echo ENTER

? echo Hello, I'm A Color
Computer ENTER
? echo Hello, I'm A Color
Computer ENTER
? ...
? unlink echo ENTER
? ENTER

OS9: TenTimes ENTER
Hello, I'm A Color Computer
Hello, I'm A Color Computer
...
OS9:
```

It may not be elegant. But, it works and serves to illustrate the point that OS-9 is not really that complicated. It's just another way of getting a job done.

OS-9 Can Do Graphics Too!

The OS-9 module that writes to your Color Computer screen can also do graphics. Just to prove the old adage that the more things change, the more they stay the same, let's look at three ways to draw a box near the edge of your CoCo graphics screen. We'll use Disk Extended BASIC first.

```
10 PMODE 1,1
20 PCLS
30 SCREEN 1,1
40 LINE (10,10) - (10,176),
PSET
50 LINE (10,176) - (240,176),
PSET
60 LINE (240,176) - (240,10),
PSET
70 LINE (240,10) - (10,10),
PSET
80 GOTO 80
```

As an alternative, we could have replaced lines 40 though 70 with Line 40 below. But, we wanted to keep our example programs parallel.

```
40 LINE (0,0) - (255,191),
PSET,B
```

To write the same program in BASIC09 we would use the following lines:

```
run gfx("mode",0,4)
run gfx("clear")
run gfx("color",7)
run gfx("move",16,16)
run gfx("line",16,176)
run gfx("line",240,176)
run gfx("line",240,16)
run gfx("line",16,16)
```

Note that when you work with graphics under OS-9, the module named `grfo` must be available in memory or in your current execution directory. We'll talk more about modules in memory and the OS-9 directories later. For now, you should know that the `gfx` in the BASIC09 program lines above is the name of a BASIC09 module that interprets the high-level language parameters within parentheses and sends out the proper control codes to the OS-9 screen driver module. The `move` command above places OS-9's invisible graphics cursor at a position 16 pixels up from the bottom of the screen and 16 pixels to the right of the screen's left edge. We drew our box in from the edge of the screen so it would be easier to see it on a monochrome monitor. All of this implies that you should be able to send these codes to the screen driver module from the OS-9 command line, and you can.

The easy way to draw the box above using OS-9 would be to use a series of command lines containing the `display` utility in a procedure file.

```
OS9: build box ENTER
? load grfo
? load display ENTER
? display F 0 4 ENTER
? display 10 4 ENTER
? display 11 7 ENTER
? display 15 10 10
? display 16 10 B0 ENTER
? display 16 F0 B0 ENTER
? display 16 F0 10 ENTER
? display 16 10 10 ENTER
? unlink display ENTER
? ENTER

OS9: box ENTER
```

You could also type `display` followed by each of the hexadecimal numbers used above in one command line. We formatted the OS-9 procedure file the way we did to make it parallel in structure to the BASIC09 program. The line with `display 15 10 10` places the invisible cursor used by the OS-9 graphics driver 16 pixels up and 16 pixels to the right of the lower left-hand corner of the OS-9 graphics screen, just like the `move` command in the BASIC09 program. Notice also that the OS-9 `display` command uses hexadecimal numbers, while the BASIC09 program used decimal numbers. The Location B0 is 176 pixels up from the bottom of the screen. The Location F0 is 240 pixels to the right of the left edge of the screen. Notice how these numbers compare to the decimal numbers in the BASIC09 and Disk Extended BASIC programs.

```
OS9: display F 0 4 10 4 11 7 15
10 10 16 10 B0 16 F0 B0 16 F0 10
16 10 10
```

You can also use the OS-9 `display` utility with the proper control codes to move the graphics cursor, set individual pixels on the screen to a specific color, draw circles and paint an area of the screen with a specific color.

Now that we have shown you that OS-9 is merely another way to give directions to your Color Computer, we'll move on to show you how to get started using OS-9. Hopefully, we'll be able to show you how to avoid a few trouble spots along the way.

OS-9 is an Operating System

Before we move on we should take a few moments to talk about operating systems. In the language of a systems designer, an operating system controls the low level processes within your computer. It gives your applications programs a way to talk to and control your hardware. It also manages your memory and other finite resources within your computer.

These processes are nothing more than short programs that happen to be running and doing a job for you. They may be putting characters in a disk file or they may be sending a series of characters to a printer. Your system resources include external devices like your terminal, printer and disk drives. They also include things inside your computer like memory and the microprocessor's time.

Just think of an operating system as a traffic cop on a busy corner. The traffic cop directs the flow of automobiles on a busy street. OS-9 directs the flow of information inside your computer, making sure that the right data gets to the right place at the right time.

Getting Started With OS-9

There are two ways to bring OS-9 to life on your Color Computer. The method you use depends on which Disk Extended BASIC ROM is in your CoCo. If you have Disk Extended BASIC 1.0 then you must use the special OS-9 boot disk that comes with your OS-9 system disk. You must insert it in Drive 0 and type `RUN"*"`. A few seconds later the screen will instruct you to insert the OS-9 master disk in Drive 0 and press any key to continue.

If you have a Color Computer with Disk Extended BASIC 1.1, then all you need to do is put the OS-9 master disk in Drive 0 and type `DOS`, a Disk Extended BASIC command that does the same thing as the `RUN"*"` command above.

After typing `DOS`, OS-9 will ask you the date and time. OS-9 uses the date and time when it saves a file. And if you forget the date or want to know what time it is, OS-9 can retrieve that information and print it on the screen. If you are using versions 1.00 or 1.01 of OS-9, `setime`, the OS-9 utility command that asks you for the time must be run each time you start OS-9. It starts the pseudo clock that runs within OS-9. If this clock is not running, OS-9 is not able to run multiple tasks.

If you want to know the current date while running OS-9, you can ask for it by using the `date` utility command that comes with your system. Simply type: `OS9: date` and press ENTER. OS-9 will print the date on your screen for you. If you need to know the time, you can ask OS-9 to print that by typing `OS9: date t` and pressing ENTER.

If you type this command right after you start the Color Computer, OS-9 will look in its module directory for a module named `date`. Since, you haven't loaded that module, OS-9 will not find it. Because it could not find the module in memory, OS-9 will look for it in its current execution directory. This directory is almost always /d0/CMDS on standard OS-9 systems. If you haven't deleted the file named `date` from your disk, OS-9 will find it, load a module named `date` into memory and execute it. After it does all of this, you will see the date appear on the screen.

If you knew you were going to ask for the date and time every few minutes, you could load the `date` command in memory. After you do this, it will appear to run instantly (`OS9: load date`). In fact, you can load a number of program modules into memory and have them available instantly. However, if you try to load too many programs into the crowded 64K workspace available with OS-9 Level I, you will quickly run into a problem — you won't have enough memory left in your computer to run the large programs that do most of your real work. BASIC09, for example, takes up approximately 22,000 bytes of memory.

All of this means you have to write

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your programs in a number of small modules while programming with BASIC09 on an OS-9 Level I system. You must then load each module from a disk when you need it. Modularity is a big plus for BASIC09, but loading a module from disk every time you need to run it can be a big pain.

OS-9 Level II Solves Many Memory Problems

If you already own a CoCo 3 with 512K of memory, rest easy. When OS-9 Level II becomes available, many of the problems feeding the myth that OS-9 is hard to use and understand will disappear. I have been running OS-9 Level II with only 240K of memory for more than four years and I have never run into a problem.

> ***"Modularity is a big plus for BASIC09, but loading a module from disk every time you need to run it can be a big pain."***

OS-9 Level II helps solve memory problems by setting up a separate 64K of workspace for each task running on your computer. Let's briefly compare OS-9 Level I and OS-9 Level II.

With OS-9 Level I you can only access 64K of memory. Part of this is due to the fact that the 6809E processor in your Color Computer can only access 64K of memory. The rest is due to the fact that OS-9 Level I does not know about memory management beyond the 64K boundary. Enter OS-9 Level II.

OS-9 Level II works with two different types of workspace. For starters, it sets aside a system workspace that holds all of the device descriptors and device drivers you need to access your hardware as well as the file managers, kernel and other internals that OS-9 needs to manage your computer's resources. And here's another bonus — that same system workspace is used for all the data memory needed by OS-9.

After setting up its own system workspace, OS-9 Level II then sets up a separate workspace for each process you start. Remember, a process is simply one of your programs that happens to be running. The important fact to remember is that each of these user workspaces can be up to 64K long. Let's get specific and show what this really means to you.

What happens when you run BASIC09 from within OS-9 Level I? In a few words, memory space is cramped and you have very little room for programs. For example, in my system I have 145 pages, or just over 36K, of memory free immediately after I start OS-9. After loading BASIC09, I have 55 pages, or just over 13K, of free memory left. That doesn't give me a lot of space to work.

Now, let's see what happens when I run BASIC09 with OS-9 Level II. After loading BASIC09 it just sits there in memory. It will be available almost immediately, but it won't be using any data workspace until I start it as a process by running it from the command line. When I do run it, I will have nearly 64K, or 256 pages, of memory available for it and the programs it is running. This means BASIC09 will be able to use approximately 64K–22K, or nearly 42K, of memory for its programs and data. In reality, there is closer to 63.5K of memory available in each workspace because the top memory locations are mapped to the hardware. But in any case, 42K of memory is much better than 13K.

Making a New OS-9 Disk

One of the most important lessons you can learn when you start to work with OS-9 is to always work with a copy of the master disk you purchased from Tandy. Never work with the original disk because accidents can happen — even to experienced hackers. So when you first run OS-9, make a backup of that precious master disk. It isn't hard to do and it shouldn't take too much time. Think of the time as a valuable investment.

First, you will need to format a new disk. To begin, type `OS9: load format free` and press ENTER. Now, take the OS-9 system master disk out of Drive 0, insert the new disk in the drive and type `OS9: format /d0` and press ENTER.

The `format` program asks you if you really want to format the disk in Drive 0. After you confirm that the disk in Drive 0 is indeed your new disk and not your master system disk, press Y for yes and the `format` program will go to work.

`Format` will then ask you to name the new disk. You can make up any name here because that name will be replaced when you back up the master system disk on the new disk. After you type the name, `format` will verify the data it placed on the new disk and you will soon see the OS-9 prompt again. When you do, type `OS9: free /d0` and press ENTER.

The `free` utility command should report that you have a total of 630 sectors on the disk and that 620 sectors are available to use. If `format` found any bad sectors on the new disk it will report a number smaller than 630. If this happens, do not attempt to back up the system master disk on to it. The OS-9 `backup` utility requires that the format of the disk you are using to hold the backup is formatted exactly like the original disk you are backing up. If the two formats are not identical, the `backup` command will not work. Don't even try.

Assuming that your new disk is good, take out the new disk and put the master system disk back in Drive 0. Then type `OS9: unlink format free` and press ENTER.

This command line removes the two utility programs you loaded earlier and frees more memory for you to use when you do the actual backup. Now type `OS9: load backup` and press ENTER.

After `backup` is loaded you must take the original master disk out of Drive 0 and put the newly formatted disk in that drive. Then type `OS9: backup s /d0 #32K` and press ENTER.

When the OS-9 `backup` utility asks if you are ready to back up from /d0 to /d0 answer with a Y for yes. The program will instruct you to get the destination disk and press any key. Since you already have it in the drive, go ahead and strike any key. OS-9 asks you if it is OK to write over the disk in the drive. Again, press Y for yes.

You'll then be asked to get your source disk ready. Remove the backup disk from the drive, insert the master system disk and then press any key. You will have to repeat the steps above several times, swapping the disks when the `backup` program asks you to, until the original disk is completely copied onto the new disk.

Now that you have a new copy of the system master disk you should store the original master disk in a safe place. The important thing to remember about `backup` is that you can only back up a disk to another disk of identical size. You cannot back up up a 35-track disk to a 40-track drive. Nor can you back up a single-sided, 40-track disk to a double-sided, 40-track disk.

To back up all the files on a disk of one format onto a disk formatted differently, you must use the OS-9 `dsave` utility command or one of the many alternative copy commands from third-party vendors. Without going into a lot of detail, here is an OS-9 command that will do the job: `OS9: dsave /d1 /d0 ! Shell` and press ENTER.

You'll notice that this command assumes you have two disk drives in operation. After you have used OS-9 a few hours, you will discover that two disk drives are indeed a necessity — not a luxury. The exclamation point in the command line above causes `dsave` to send its output to the OS-9 command interpreter, which is named Shell. It is an example of the pipelines we mentioned earlier.

Customizing Your Disks

One of the most important advantages of OS-9 is the fact that it lets you customize your system to your heart's content. Unfortunately, this ability also makes a tremendous contribution to the myth that OS-9 is difficult to use and hard to understand.

Make the pledge right now to stick with the basics until you are ready to start modifying your system. Practice running the utility commands that are stored in the /d0/CMDS directory of your working system disk. Follow the directions in the OS-9 manuals or *The Complete Rainbow Guide To OS-9* carefully. After you understand what is happening when you run each command, you can move forward freely and modify your computer as you like.

Many of the problems you'll encounter if you are running OS-9 Level I revolve around the severe memory constraints forced on you by the limited 64K workspace. In fact, many of the error messages you receive when you start to work with OS-9 procedure files will occur because there is simply not enough memory to load in the module required to do a specific task.

Another error message you may see quite often at first is Error 216 — File Not Found! This error pops up a lot for beginners because they do not fully understand the OS-9 file system.

The important thing you must understand is that OS-9 always maintains two working directories. One of these directories is called the current execution directory. The other is called the current data — or working — directory.

OS-9 always looks in the current execution directory when it is looking for a file that contains a program it needs to run. Likewise it usually stores all data files and looks for procedure files in the current data directory.

Here's the trick. The current execution directory and current data directory are seldom stored in the same physical position on two different disks. This means that even though these directories may have the *same* names on both disks, they are often not located on the same track or sector. Because of this, OS-9 will not be able to find your

Listing 1: `fixtime`

```
**************************************************
*
* FIXTIME  -  COPYRIGHT (c) 1986 by S. B. GOLDBERG
*
* Updates time to help correct clock for disk usage.
*
* Counter update is $49 from start of module.  Use
* Debug to change timing count, if necessary.  In-
* crease the count to slow the clock, decrease the
* count to speed up the clock.  Check clock operation
* and change in source code when it keeps good time
* and re-assemble object module.  Do NOT unlink fixtime
* while testing, or you'll have a total system crash.
*
* Fixtime can't be unlinked if part of OS9Boot file.
* Use OS9Gen to add fixtime to boot file and execute
* from your startup file.  Do NOT use Cobbler after
* executing fixtime, the CRC and header will not be
* correct!!!
*
         ifpl
         use    /d0/defs/os9defs
         endc
*
***************************************
* SET COUNT TO KEEP YOUR CLOCK ON TIME *
***************************************
count    equ    8    disk access count
vector   equ    $010A   NMI vector address
*
         mod    len,name,prgrm+objct,reent+1,entry,dsiz
*
         rmb    200   stack
dsiz     equ    .
*
name     fcs    /fixtime/
         fcc    /(c) 1986 S.B.GOLDBERG/
*******************************
*
* INITIALIZE AND QUIT
*
entry    ldx    vector   get NMI vector
         stx    1+jump,pcr   save it
         leax   fix,pcr   time correction address
         stx    vector   put in NMI vector address
         lda    #$3d   new entry offset
         sta    name-3,pcr   put in header
noerr    clrb   clear error flag
         os9    f$exit   quit
*******************************
*
* THIS DOES THE ACTUAL WORK
*
counter  fcb    count   disk access counter
fix      dec    counter,pcr   update time?
         bne    jump   not yet
         lda    #count   yes, counter value
```

current directories if you swap disks without telling it.

Here's the solution. If you remove one disk from a drive and insert another, always type:

```
OS9: chd /d0/MyDirectory ENTER
OS9: chx /d0/CMDS ENTER
```

Note that the directory names in these two command lines are simply examples and you need to type the names of the actual directories stored on the disk you have inserted.

Hopefully, we have given you enough information to get you started and pointed out a few of the pitfalls to avoid when you first start running OS-9. Hang in there and practice. Stick with the simple utilities until you thoroughly understand what is happening when you run them. After you conquer a command, move on to another. Before long, you'll be able to control your Color Computer like you never could before.

And, if the Not Enough Memory Errors are driving you crazy, just remember that OS-9 Level II and 512K of usable memory at your fingertips is just around the corner with the new CoCo 3. I have a hunch that the new visual shell that Microware and Tandy are developing will bring intuitive computing and applications to OS-9. Things should really be fascinating in about a year.

CoCo SIG Database Expanding

The OS-9 database in RAINBOW's CoCo SIG on Delphi is really expanding. I understand that the complete library of the OS-9 Users Group should be available soon. And even without the Users Group Library, the number of files has expanded dramatically in the last few months.

You can now find beginners' tutorials and help with downloading files in a series of excellent articles in the database. In addition to the articles, you will find several dozen programs including a disassembler, Steve Bjork's bouncing ball demos and many utilities. You will even find drivers and descriptors for the J&R Banker RAMdisk and the Speech/Sound Cartridge from Tandy. Plus, you'll find a number of files that show you how to patch several OS-9 programs. Take a look; you'll like what you see!

Tips From Bob Rosen

Bob Rosen reports that to use a monochrome monitor on the Color

```
          sta    counter,pcr   reset counter
          leax   pack,pcr   address for time package
          os9    f$time   get time
          lda    #60    time check constant
          inc    5,x    add a second
          cmpa   5,x    totals minute or more?
          bhi    newtime   no, set new time
          clr    5,x    yes, make seconds zero
          inc    4,x    add one minute
          cmpa   4,x    hour or more?
          bhi    newtime   no, set new time
          clr    4,x    yes, zero minutes
          inc    3,x    add an hour
newtime   os9    f$stime   set new time
**********************************************
* You MUST use '>00' to force extended address
*
jump      jmp    >00    goto NMI handler
*
**********************************************
pack      fcb    00,00,00,00,00,00
          emod
len       equ    *
          end
```

Listing 2: `reboot`

```
/*
 * OS9 ReBoot
 *
 * Copyright 1986 by R.M. Santy
 */
#include <stdio.h>
#include "module.h"
#include "os9defs.h"

#define SECTOR 256
#define SECS_TRACK 18
#define TRACK_SIZE (SECTOR * SECS_TRACK)
#define BOOTSIZE TRACK_SIZE
#define TRACK34 ((long) TRACK_SIZE * 34)

#define SYSERR -1

/*
  Track 34 of boot disk is loaded
  into the following buffer.
 */
char bootstrap[BOOTSIZE];
/*
  If a hard disk has a bootable partition,
  the byte starting byte address is placed
  in the following 24 bit buffer.
 */
char offset[3];
/*
  Any failure causes the following message
  to be displayed.
 */
char *usage = "Usage: ReBoot /devname\n";
/*
  The device descriptor's address is copied
  here.
 */
```

```
mod_dev *device;
/*
  The device driver's address is copied
  here.
 */
mod_exec *driver;
/*
  The bootable diskette or hard disk
  partition's file number.
 */
FILE *disk;
/*
  The bootable diskette or hard disk
  partition's device name.
 */
char devname[32];
/*
  The bootable diskette or hard disk
  partition's driver name.
 */
char drivername[32];
int temp;
/*
  Reboot main program.
 */
main(ac,av)
int ac;
char *av[];
  {
  /*
    Reboot has no default argument.
   */
  if (ac != 2)
    failed("Wrong number of arguments");
  /*
    Argument 1 is the diskette or hard disk
    partition name.
   */
  strcpy(devname,av[1]);
  /*
    Try to link to the device.  Success if
    the device is already in the module
    directory.
   */
  device = modlink(&devname[1],DEVIC,OBJCT);
  /*
    Verify existence.
   */
  if (device == SYSERR)
    {
    /*
      No problem, try to load it.
     */
    device = modload(&devname[1],DEVIC,OBJCT);
    /*
      Verify existence.
     */
    if (device == SYSERR)
      /*
        Now we have a problem.  The device
        descriptor is not in the execution
        directory!
       */
```

Video Composite output of the CoCo 3 you can type:

```
WIDTH 80: PALETTE 8, 255:
PALETTE 0, 0
```

To have your CoCo 3 tell you who wrote the Microware Disk patch, type:

```
WIDTH 40 : CLS 9 : CLS 100
```

And, finally, Rosen researched the pinout of the RGB monitor jack and shares it here. Looking at the outside of the RGB out jack on the bottom of the computer, you'll see the following pinout:

9 7 5 3 1

10 8 6 4 2

Here are the connections:

1. Ground
2. Ground
3. Red
4. Green
5. Blue
6. Polarity (No Pin)
7. Sound
8. Hsync
9. Vsync
10. No connection

> ***"If you own several versions of OS-9, make sure you use only the utility commands that came with each version."***

OS9Gen Tips From Walt Weber

We received a nice note with several tips from Walt Weber in Marysville, Wash., recently that repeats some advice we have mentioned several times in the past but which bears repeating. If you own several versions of OS-9, make sure you use only the utility commands that came with each version. The same is especially true if you are using the `ASM` command that comes with OS-9. You need to make sure that you use the OS9DEFS files that came with the version of OS-9 you are currently using. If you don't, tricky bugs can sneak into your object code that will be almost impossible to find.

Weber has done a lot of experiment-

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```
    failed("Loading descriptor");
   }
 /*
   Ok, we will access the boot device
   directly.
  */
 strcat(devname,"@");
 /*
   Need to find the device's driver now.
   Get the bas address of the descriptor.
  */
 temp = device;
 /*
   Copy the name of the driver from the
   descriptor.
  */
 strhcpy(drivername,device->m_ddname+temp,32);
 /*
   Hard disk descriptors that support booting

   will have their partition offsets
   copied.
  */
 _strass(offset,device->m_control,3);
 /*
   Now link to the driver.
  */
 driver = modlink(drivername,DRIVR,OBJCT);
 /*
   Verify.
  */
 if (driver == SYSERR)
   {
   /*
     Driver not in memory, try to load
     it.
    */
   driver = modload(drivername,DRIVR,OBJCT);
   /*
     Verify.
    */
   if (driver == SYSERR)
     /*
       Driver not in execution directory either!
      */
     failed("Loading driver");
   }
 /*
   Ok, now open the boot device.
  */
 disk = open(devname,1);
 if (disk == SYSERR)
   failed("Opening device");
 /*
   Seek to sector 0 to satisfy the RBF
   manager's thirst for its contents.
  */
 if (lseek(disk,0L,0) == SYSERR)
   failed("Seek to Sector 0");
 /*
   Fake read.  RBF will get a copy of
   the identification sector here.
  */
```

ing with the `OS9Gen` command. In fact, he has written a program named *GenMod* which is available in the DL6 section of the OS-9 *SIG* on CompuServe. It adds three options to an existing `OS9Gen` command and fixes a few bugs he located in the original. *GenMod* makes it easier to change your `OS9Boot` file if all you need to do is delete and/or add a module to it.

While he was experimenting with `OS9Gen` he learned that the OS-9 kernel gets located at $F000 and is $F00 bytes long in Version 1.00. However, in Version 2.00.00, it is located at $EF00 and is $F80 bytes long. Unfortunately, it seems these locations and lengths are hard coded into `Cobbler` and `OS9Gen`. Version 1.00. of these commands marks the 15 sectors of Track 34 allocated in the disk allocation map of the diskette. Version 2.00.00 marks all 18 sectors, even though only 16 contain the kernel.

This means that if you boot up in Version 1.00, but use `OS9Gen` from Version 2.00, the wrong data will be written to the disk on Track 34. Booting up in Version 2.00.00 and using `OS9Gen` from Version 1.00 won't work either.

Weber also found a bug in Version 2.00.00 of `OS9Gen`. It seems that it will rewrite Track 34 if it determines that an OS-9 kernel is on the track. But, a bug in both `Cobbler` and `OS9Gen` can cause problems in the disk allocation map when a kernel is already on Track 34. Here is Weber's patch. The `Cobbler` patch begins at an offset of 23F from the beginning of the module.

```
OLD: EC 84 81 4F 10 26 00 A6 C1 53
     10 26 00 A0 A6 04
NEW: CC 4F 53 10 A3 84 10 26 00 A4
     A6 04 30 C8 52 12
```

Here is the `OS9Gen` patch. It begins at an offset of 47F.

```
OLD: EC 84 81 4F 10 26 01 06 C1 53
     10 26 01 00 A6 04
NEW: CC 4F 53 10 A3 84 10 26 01 04
     A6 04 30 C9 02 00
```

Additionally, you must change the A7 at an offset of 4A9 to an A6, and the 1D at an offset of 4AD to an 18.

Fixtime

Stephen B. Goldberg, of 695 Plainview Road, Bethpage, NY 11714, has contributed another interesting utility program. He wrote `Fixtime` because he got fed up with having the system clock end up 20 or 30 minutes slow after a long session at his CoCo. `Fixtime` is his *attempt at keeping* the clock on time. It does violate several rules of OS-9 programming. It is self-modifying and it loads and stores to fixed addresses. But it works. It must be loaded before you run it and Goldberg reports that he thinks it is a good idea to add it to your `OS9Boot` file after you have debugged it so that it won't get unlinked accidently. If the `Fixtime` does get unlinked after you run it, your system will crash. Also, after you have run `Fixtime` you cannot use Cobbler to generate a new OS9Boot file.

ReBoot

Bob Santy of Medford, Mass., and Greg Law both caught me when I stated that you couldn't remove the floppy disk driver and descriptor when running OS-9 from a hard disk. I stand corrected. While writing this column, I often need to transfer files from a disk someone mails me to my hard disk.

Because of this constant use, it never occurred to me that I could run the system without the floppy drivers — even though I could always load them in and use them when needed. The fact that the Tandy hard disk I used for several months seldom found the `/h0` descriptor like it should until it had been running for several hours, also sidetracked me.

As Santy pointed out in his letter, the boot module stored with the kernel and init on Track 34 of a Color Computer OS-9 disk is completely self-contained and capable of reading the system into memory without the CCDisk driver and `/d0` device descriptor. This means if you are using a hard disk you can save a lot of memory by not loading the floppy drivers. This can be a big help to you if you want to run the Tandy/Microware C compiler on the Color Computer.

Santy contributed the `reboot` utility program listed this month. It requires the pathname of the device you want to boot as an argument. He wrote it for use with the hard disk he purchased from Software Support of Ashland, Mass. That disk has bootable partitions and `reboot` works well on that device.

Even if Santy's utility will not work with your hard disk, it is full of excellent C code that may help you when you need to write other C utilities. It is an outstanding example of how good comments make a program easier to understand, and it is a valuable contribution. ☐

```
    if (read (disk,bootstrap,256) == SYSERR)
      failed("Reading Sector 0");
    /*
      Ok, now seek to the bootstrap on
      track 34.
     */
    if (lseek(disk,TRACK34,0) == SYSERR)
      failed("Seek to Track 34");
    /*
      Read the entire track into the buffer.
     */
    if (read (disk,bootstrap,BOOTSIZE) == SYSERR)
      failed("Reading Track 34");
    /*
      Verify that the track contains a bootstrap.
     */
    if (strncmp(bootstrap,"OS",2) == 0)
    {
    /*
      Ok, all is well.  The bootstrap is in memory
      and we are all set to execute it.
     */
#asm
 orcc #$50      Disable interrupts
 leax offset,y  Copy hard disk partition offset
 ldu #$3800     Hard disk boot module is
 ldb #3         Coded to find the partition
oloop
 lda ,x+        Offset at $3800 in RAM
 sta ,u+
 decb
 bne oloop
 lda >$3800     Check to see if
 cmpa #$FF      Booting floppy
 beq fboot      Floppy boot!
 lda #$22       Hard disk boot!
 sta >$FF7F     Select slot 3 of Multi-Pak
fboot
 clr >$78       Warm start indicator
 clra           Set DP to 0
 tfr a,dp
 leay bootstra,y Get base of boot
 jmp 2,y        Execute bootstrap
#endasm
    }
  failed("Disk not bootable!");
  }

/*
  Any failure uses this exit routine.
  Display specific error message and
  exit.
 */

failed(msg)
char *msg;
  {
  printf("ERROR: %s\n",msg);
  printf(usage);
  exit(errno);
  }
```

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> — The RAINBOW, Jan. 1982

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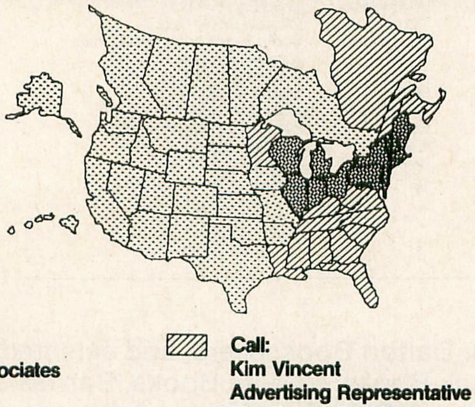

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- **REQUIRES 1 OR 2 DRIVES**
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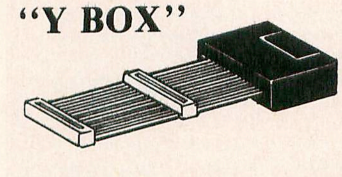

If you have ever owned a **"Y" Cable** you know how easy it is to 'bump' or dislodge the cable from the computer. With the positive mechanical connection of the **"Y Box"** chances are greatly reduced of the "Y" coming dislodged.

One of the most common causes of a shorted data bus in the CoCo is a misaligned or loose **"Y" Cable**. Don't let your computer be the next victim of a **"Y" Cable**. order the **"Y Box"** from COMPUTIZE.

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Deluxe backup utility for the Radio Shack Color Computer.

- Backup a disk in as few as 32 seconds (in three passes)
- Format and backup a full disk in one minute
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Displays the current track that is being processed, works with all ROM versions. Supports 1 or 2 disk drive. A great disk production tool.

GRAPHICOM $24.95

Catalog No. 111GD

Simply stated - One of the finest graphic programs written for the Color Computer!

FEATURES:

- S-U-P-E-R U-S-E-R F-R-I-E-N-D-L-Y !
- Supports 4 Hi-Res display modes
- 4 page animation mode
- Color Palette with over 15 color patterns for use with Hi-Res artifact
- Send/Receive pictures over modem
- Supplied utility allows capturing Hi-Res screens from most COCO arcade games
- Multiple Hi-Res character fonts (user redefinable)
- Supplied utility for transferring Graphicom screens to Basic or other M/L programs.
- Supplied utility for loading screens from Basic or other sources
- Built in Hi-Res SCREEN PRINT (compatible with EPSON, C-ITOH, GEMINI-10, OKI, plus Radio Shack's LP-VII, LP-VIII, DMP-100, DMP-200, and GCP-115 printers) from 110 to 9600 baud
- SEND/RECEIVE slow-scan television
- Many additional features, operating hints, hardware mod's and suggestions, etc.

REQUIRES 64K COCO, 1 DISK DRIVE, AND 2 ANALOG JOYSTICKS

Season's Greetings

Announcing COLORSCAN, new software for the CGP-220. This program is a must for anyone who owns a Radio Shack Ink Jet Printer, and enjoys creating graphics with Graphicom, Graphicom Part II, CoCo MAX, or any program that produces a standard 6K binnary picture files.

This program contains some of the popular features found in "HARDCOPY" such as 1x1, 2x2 and posters; but color scan produce full color printouts of your favorite 6K graphics files. You can also create colorful banners up to 27' in length, or dump a disk's entire graphic contents to paper.

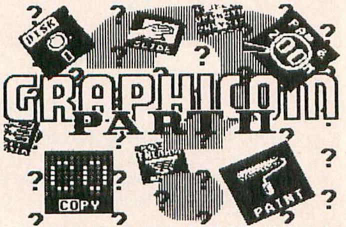
Colorscan will print program listings in blazing color, make remarks in red, line numbers green, search for strings and print in blue, etc. All these features and more.

Colorscan catalog number 184WD $29.95

GRAPHICOM PART II

Catalog No. 132WD . $24.95

GRAPHICOM PART II DOES NOT REQUIRE GRAPHICOM TO RUN!



Graphicom Part II is a video processing package that provides many functions that are missing in Graphicom. Here are just a few of the features provided by Graphicom Part II:

ENLARGE/REDUCE/ROTATE

Enlarge or reduce any portion of a graphic screen, just like a photographic enlarger! Rotate by any degree or fraction of a degree around any point on the screen.

PAINT

Paint or "fill-in" any irregular area on the screen! More than 50 different colored patterns available. Additional paint patterns may be user-defined.

PAN & ZOOM

"Zoom in" x2, x4, or x8 on any portion of the screen to do fine pixel work. Allows editing of Graphicom character sets with ease!

TYPESETTER & FONT EDITOR

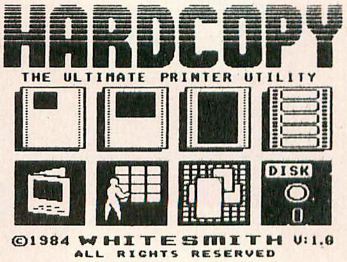
Add text in 16 different sizes, also supports user definable foreground & background colors. Design & Edit characters for use in the typesetter.

PIXEL BLASTER

Allows the user to easily substitute or remove colors. Widen lines, swap BLUE & RED without effecting BLACK & WHITE, etc.

Graphicom Part II requires a 64K extended disk basic system, and supports 1 to 4 disk drives, keyboard or joystick (analog or switch type) input. It will load and save both **Standard BIN** files and **Graphicom** screens. All functions support color or Hi-Res operation, as well as the 4 screen display modes.

ARE YOU LOOKING FOR A HI-RES GRAPHIC SCREEN PRINT PROGRAM?



HARDCOPY - Hardcopy is more than just a screen print utility, compare these features with any other graphic dump program on the market;

- Full GRAPHICOM/GRAPHICOM PART II compatibility! Loads STANDARD 6K images, GRAPHICOM pictures, and COCO MAX pictures too!
- BLACK & WHITE or GREY SCALE printing. In GREY SCALE printing, colors are printed as user definable patterns. Supports hi-res in all 4 GRAPHICOM display modes!
- **1x, 2x, 3x PRINTOUTS** - Three menu options are reserved for the most frequently used printout sizes; 1x (quarter page), 2x (half page), and 3x (full page).
- **GRAPHIC LABELS** - The label printing option allows the user to create custom mailing or disk labels with professional looking results.
- **GREETING CARDS** - The greeting card option allows the user to custom design greeting cards using both text and graphics.
- **GIANT POSTERS** - The poster option provides the user with a means of reproducing a hi-res graphic to a multi-sheet poster.
- **SPECIAL EFFECTS** - The special effects option allows the user to directly control the printing directives; ROTATION, X/Y SIZE, X/Y FLIP, X/Y GRID, X/Y FILL, TAB, WINDOW, POS/NEG IMAGE, and more!
- **USER CALL** - Have an application that **HARDCOPY** doesn't quite match? **HARDCOPY** routines can be added to EXTENDED BASIC through the USR command!

HARDCOPY* requires a 64K Color Computer or Color Computer II, and at least one disk drive. It supports 1 to 4 disk drives, keyboard or joystick input. Please specify **printer** and **cat. number** when ordering.

* Due to hardware differences, some features may function differently on certain printers.

IDS 480/560-G	Cat. No. 170WD
Oki 82A (Okigraph)	Cat. No. 179WD
Okidata 92	Cat. No. 171WD
Gemini 10X	Cat. No. 174WD
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DMP-105	Cat. No. 183WD
Epson LX-80	Cat. No. 173WD
Epson MX-80	Cat. No. 172WD
Epson RX-80	Cat. No. 173WD
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Riteman PLUS	Cat. No. 177WD
DMP-110	Cat. No. 180WD
DMP-120	Cat. No. 176WD
DMP-130	Cat. No. 182WD
DMP-200	Cat. No. 175WD
CGP-220	Cat. No. 181WD

HARDCOPY PRINT UTILITY $29.95

Most Howard Medical products are COCO 3 compatible, some require special patches. Please inquire when you order.

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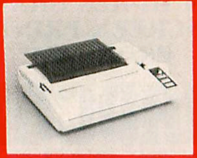

NEW Dual Mode EPSON LX-80

The LX-80 offers draft or near letter quality plus a 1K input buffer for much faster graphics *printing speed*. LX-P package includes the LX-80, a Botek serial to parallel converter, and a Howard Printer Tutorial.

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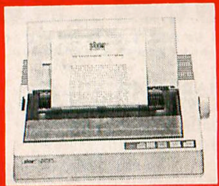

STAR NX-10

The NX-10 is the latest generation of printers and offers built-in back tractor feed giving forward and backward movement of paper plus exceptional graphics printing capabilities. NX-P package includes the NX-10, a Botek serial to parallel converter and the Howard Printer Tutorial. **$299** **($7 shipping)**

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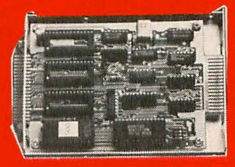

DC-3

DISTO

Includes controller and C-DOS ROM chip.

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C-DOS 3.3 28 PIN ROM makes Disto DC-3 work with CoCo 3. **$20**

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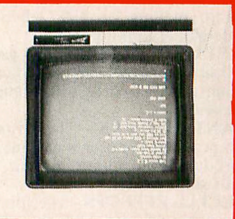

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All monitors require an amplifier circuit to drive the monitor and are mounted inside the color computer. They attach with spring connectors, with two wires extending out of the computer, one for audio and one for video.

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- Un-DISK comes with comprehensive instructions which you may not need because:
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- Un-DISK is provided on cassette.
- Un-DISK is faster than a slow clumsy DISK DRIVE and best of all . . .
- Un-DISK is CHEAPER than a DISK DRIVE!
- Un-DISK will work even if you already own a disk but WHY BUY A DISK AT ALL?
- Un-DISK should be in the library of every serious CoCo user even if you own a disk says Frank J. Esser, independent reviewer for RAINBOW Magazine!

OK sure, disk drives ARE NICE. I own one. But if your finances are limited, the Un-DISK can give you much of the power of the mechanical drive. Even if you already own a disk the Un-DISK can work like a super fast extra disk.

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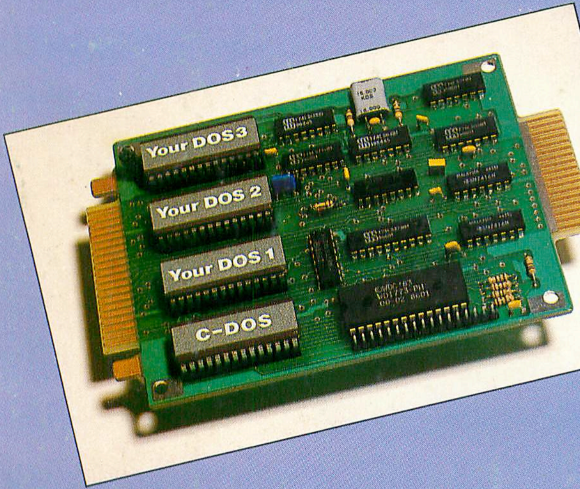
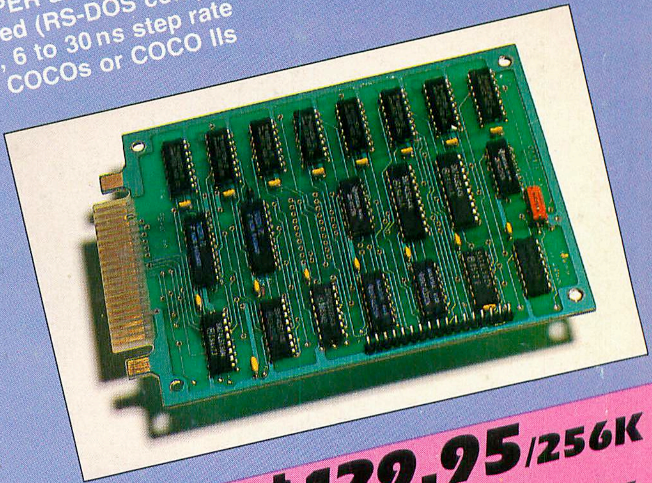
- Works on all COCOs or COCO IIs





DISTO SUPER RAMDISK $129.95/256K $169.95/512K

- Inexpensive 2nd drive Emulator
- Works with all COCOs (Multi-Pak required)
- Easy installation, Just plug in and go
- Low software overhead
- Much faster than a regular drive
- Plain language instructions
- Complete OS-9 Drivers available*
- Compatible with COCOMAX if used with C-DOS+
- Internal Mini-Expansion-Bus for DISTO ADD-ONS
- Gold contacts on all connectors
- Shielded metal box

DISTO SUPER ADD-ONS
Four add-ons are currently available

- **REAL TIME CLOCK/PRINTER INTERFACE**
  An internal clock that will keep the proper time, date and year. A small battery keeps the time when the computer is off. Retreive and set the time by using simple Basic Pokes. The Real Time Clock/Parallel Printer Adapter is a single unit. Software drivers included. $39.95
- **MINI EPROM PROGRAMMER**
  Yes, a low cost programmer that attaches to the DISTO SUPER CONTROLLER or SUPER RAMDISK. Program those often used utilities into EPROMs and plug them directly into your controller. Will program 2764's or 27128's. A perfect mate for the DISTO SUPER CONTROLLER. $54.95
- **DISPLAY 80 SUPER CARD**
  A real knock-out. DISPLAY 80 is a three in one card. It's major function is to add an 80 column by 24 line display to your computer. This feature packed package also includes a REAL TIME CLOCK and PARALLEL PRINTER INTERFACE. An all-in-one package that fits neatly inside the Controller or Super Ramdisk. OS-9 software available*. $139.95
- **HARD DISK INTERFACE (Coming soon)**
  Fits inside Super Controller or Super Ramdisk. S.A.S.E. interface compatible. OS-9 Drivers available*. Supports WD-1002-SHD or ZEBEC 1410 controller.

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*All OS-9 drivers sold separately